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# BLOUNTSTOWN REACH, APALACHICOLA RIVER

## Movable-Bed Model Study

by

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US ARMY ENGINEER WATERWAYS EXPERIMENT STATION

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)


The Blountstown Reach, Apalachicola River, is located between navigation miles 81 and 76. This area requires approximately 107,000 cu yd of dredging annually to maintain the navigation channel.

The model study was conducted to examine the dredged material disposal in the thalweg and within the bank and to develop a system of contraction works to develop and maintain the navigation channel with little or no maintenance dredging.

The model, built to a horizontal scale of 1:120 and a vertical scale of 1:80, was of the movable-bed type and allowed for inflow from both the Apalachicola River and Sutton Lake.

The three phases of the model study were as follows:

a. Thalweg disposal. Disposal of dredged material in the deep portion of the bendways.

b. Within-bank disposal. Disposal of the dredged material within the waterline and no closer than 100 ft from the navigation channel.

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c. Contraction works. Use of training works to contract channel width and improve sedimentation conditions. Plan A was the initial plan suggested by the Mobile District that was modified to improve its efficiency. Plan B was a progressive development of training works.

Results of the study indicate the following:

a. Thalweg disposal of dredged material had little effect on channel maintenance during low- or average-water years; but following high-water years, dredging would be significantly greater.

b. Within-bank disposal of dredged material provided some improvement of the navigation channel during low- and average-water years, but required much more dredging than typical following high-water years.

c. Plan A provided little improvement in maintaining a navigation channel.

d. Plan B (B-14) developed and maintained an adequate navigation channel during all water years tested except for a marginal channel crossing at mile 77.40.

# PREFACE

This model investigation was conducted for the US Army Engineer District, Mobile (SAM), by the US Army Engineer Waterways Experiment Station (WES). The model study was completed in February 1983.

The investigation was conducted by personnel of the Hydraulics Laboratory (HL), WES, under the general supervision of Messrs. H. B. Simmons, former Chief, HL (retired), F. A. Herrmann, Jr., present Chief, HL, and R. A. Sager, Assistant Chief, HL, and under the direct supervision of Messrs. J. E. Glover, Chief of the Waterways Division (retired), J. E. Foster, Chief of the River Regulation Branch (retired), and C. W. O'Neal, present Chief of the River Regulation Branch. The engineer in immediate charge of the model was Mr. R. A. McCollum, assisted by Mrs. P. A. Birchett and Messrs. H. S. Headley III and V. E. Stewart, all of the River Regulation Branch. This report was prepared by Mr. McCollum, assisted by Mrs. Birchett and Mr. O'Neal. SAM representatives who were actively involved in the study were Messrs. Wayne Odom, Kenneth Underwood, William Stubblefield, and Bruce Murray. This report was edited by Mrs. Marsha C. Gay, Information Products Division, Information Technology Laboratory.

COL Dwayne G. Lee, EN, is the Commander and Director of WES. Dr. Robert W. Whalin is Technical Director.

CONTENTS

## CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

| Multiply | By | To Obtain |
|---|---|---|
| cubic feet | 0.02831685 | cubic metres |
| cubic yards | 0.7645549 | cubic metres |
| degrees (angle) | 0.01745329 | radians |
| feet | 0.3048 | metres |
| inches | 2.54 | centimetres |
| miles (US statute) | 1.609347 | kilometres |

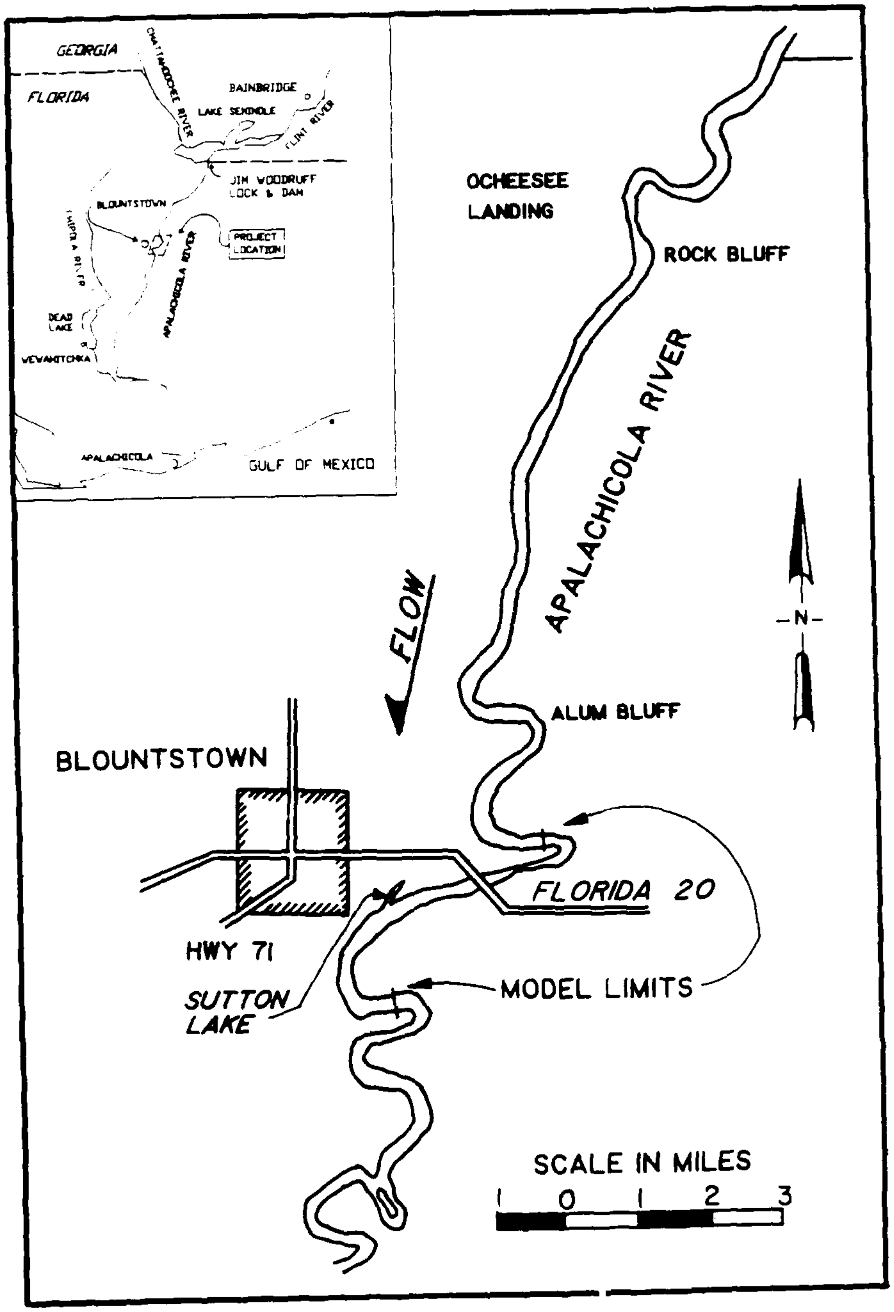


Figure 1. Vicinity map

## BLOUNTSTOWN REACH, APALACHICOLA RIVER

### Movable-Bed Model Study

## PART I: INTRODUCTION

### Background

1. The Apalachicola River begins at the confluence of the Chattahoochee and Flint Rivers at the Georgia-Florida State line and flows south through the Florida Panhandle to Apalachicola Bay, an estuary on the Gulf of Mexico. Flow through the upper Apalachicola River is controlled by releases at the Jim Woodruff Lock and Dam located inside the Florida State line, 106 river miles from the Gulf of Mexico. The authorized project for the Apalachicola, Chattahoochee, and Flint Rivers calls for a navigation channel of 9 by 100 ft* from Columbus, Georgia, on the Chattahoochee River and Bainbridge, Georgia, on the Flint River to the mouth of the Apalachicola River at Apalachicola, Florida.

2. There are several reaches on the Apalachicola River where maintaining an adequate navigation channel is difficult. One of the highest priority reaches is the area from navigation mile 81 to 76, usually referred to as the Blountstown Reach (Figure 1). This reach consists of a short-radius, 180-deg bend in the upper end and a long-radius bend at the lower end connected by a relatively straight section of over 2 miles that passes through the State Highway 20 bridge. Relatively low overbank elevations in the area allow high-stage flow to bypass the Apalachicola River upstream of the study reach and reenter through Sutton Lake just upstream of Blountstown. The flow reentering through Sutton Lake is over 50 percent of the total flow measured at Blountstown on flood flows over 150,000 cfs.

### Need for and Purpose of Model Study

3. Frequent dredging is required in several areas of the Blountstown Reach with the largest problem being centered just upstream and downstream of

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* A table of factors for converting non-SI units of measurement to SI (metric) units is found on page 3.

the entrance to Sutton Lake. Average annual dredging for the reach is about 107,000 cu yd. Capacity of existing disposal sites is rapidly diminishing and obtaining new sites for disposal is increasingly difficult. Alternative sites for dredged material disposal such as within the navigation channel, within the waterline on existing sandbars, and in upland contained sites are being considered.

4. A model study was considered essential to determine the effects of proposed methods of dredged material disposal and develop a contraction works plan to improve the navigation channel. The specific purposes of the model study were as follows:

- a. Demonstrate the effects of thalweg disposal of dredged material in the bends.
- b. Demonstrate the effects of within-bank disposal of dredged material placed on the bank adjacent to the dredged areas.
- c. Develop a contraction works plan to eliminate or reduce the maintenance dredging required in the reach.

## PART II: THE MODEL

### Description

5. The Blountstown Reach model was of the movable-bed type built to a horizontal scale of 1:120 and a vertical scale of 1:80. The model reproduced the prototype area from navigation miles 81 to 76 (Plate 1). The overbank and bed were molded in crushed coal having a median grain diameter of 4 mm and a specific gravity of 1.3. The fixed bank line and nonerodible bed material were molded in crushed stone. Stone-filled dikes were reproduced with crushed stone, and pile dikes were simulated by rows of metal rods.

6. The fixed bank lines and overbank portions of the model were molded from the edge of the movable bed using a composite of the August-December 19[illegible] hydrographic survey, June 1977 hydrographic survey, 1943-1944 US Geological survey,* and 1974 and 1976 aerial photographs.** The movable bed, at the start of adjustment tests, was molded reproducing the June 1977 hydrographic survey (Plate 2). The initial bed condition for most test plans was the June 1978 hydrographic survey (Plate 3). Reproduction of existing prototype stone and wood-pile dikes was based on construction drawings dated April 1963 and January 1972 and upon the hydrographic survey dated June 1977.

### Appurtenances

7. Water was supplied to the model by a circulating flow system and was measured by a 6- by 3-in. venturi meter. Water-surface elevations throughout the model were measured with eight piezometer gages. Tailwater elevations were controlled with an adjustable tailgate at the lower end of the model. Bed material was measured in a graduated container and introduced by hand at the upper end of the model. A sediment trap was provided at the lower end of the model to collect material leaving the model so it could be measured to determine the amount of material discharged following each test. Bed elevations in the model were obtained with a surveying rail and rod which permitted the reading of bed elevations in prototype feet. Sheet metal

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* US Geological Survey, 1945, "Blountstown Quadrangle," US Department of the Interior, Washington, DC.

** US Army Engineer District, Mobile, 1976, "Apalachicola, Chattahoochee, and Flint Rivers Navigation Charts," Mobile, Ala.

templates were used for molding the model bed prior to testing. Carefully graded rails along either side of the model provided support for the templates at the appropriate elevation and for the model survey rail and controlled the grade of structures during installation.

## PART III: TESTS AND RESULTS

### Model Adjustment

8. Before the improvement plans were tested, the model was adjusted until it reproduced to a reasonable degree of accuracy the conditions shown by available prototype surveys. The model bed was molded to the June 1977 hydrographic survey, and the stage and discharge hydrograph (Plate 4) recorded between the dates of this survey and the June 1978 hydrographic survey was reproduced. Both prototype surveys were taken during low water following the spring high water. This adjustment test was repeated, modifying supplemental slope, discharge ratio, and bed-load material input until an acceptable degree of agreement between the model survey and the June 1978 prototype survey (Plate 3) was achieved.

9. The results of the final adjustment (Plate 5) indicate that the model generally reproduced scour and deposition tendencies of the prototype. However, the bends tended to be about 2-4 ft deeper and the crossings about 2-4 ft higher than those in the prototype. The channel between navigation miles 78.5 and 78.1 was also shoaled about 2-4 ft higher than the 1978 prototype survey. Based on professional judgement from similar model studies, this adjustment was considered acceptable for the testing program planned, but differences between the model and prototype scour and fill elevations should be considered in evaluating test results.

### Base Test

#### Description

10. The base test was conducted using the existing prototype conditions to determine the trends that would develop in the model after two reproductions of the 1973-1974 typical water-year hydrograph (Plate 6), selected by the US Army Engineer District, Mobile, to be representative of a typical water year for this reach. Before the start of the first hydrograph reproduction, the model was molded to the bed configuration of the June 1978 hydrographic survey, the navigation channel dredged to 9 ft below the low-water reference plane (LWRP), and the dredged material placed in designated disposal areas. The second reproduction of the hydrograph began with the bed condition from the end of the previous run with no additional dredging.

## Results

11. The results after two reproductions of the testing hydrograph (Plate 7) indicated inadequate channel depth in the crossing at mile 80.2. From this point to mile 78.5 the channel was narrow and poorly aligned for navigation through the Highway 20 bridge. The channel from miles 78.5 to 77.3 shoaled in four areas above minimum navigation depth by 1-3 ft and the remaining channel in this reach had inadequate width The channel below mile 77.3 maintained both adequate width and depth. The base test was consistent with observed prototype behavior in all of the areas where dredging is required annually.

# Thalweg Disposal Tests

## Description

12. Thalweg disposal tests consisted of depositing dredged material in the deep area of the bendway channel to 12 ft below LWRP. This material was obtained from dredging in the channel as far as 1 mile upstream of the deposit sites. The average prototype dredged material quantity for the area just upstream of the first bend (miles 80.9 to 80.7) was 34,000 cu yd, and the quantity for the lower bend (miles 77.3 to 76.6) was 107,000 cu yd. A total of four tests were conducted using the dredged material placed in the bendway channel. The first two tests used the 1973-1974 typical water-year hydrograph (Plate 6), Test 3 used the 1967-1968 low-water hydrograph (Plate 8), and Test 4 used the 1977-1978 high-water hydrograph (Plate 4). Test 1 started with the bed remolded to the June 1978 bed configuration and the model equivalent of 34,000 cu yd of dredged material placed in the upstream bend. Of the 107,000 cu yd of dredged material available, only the equivalent of 55,000 cu yd was required to fill the downstream bendway to capacity. Test 2 added enough bed material to replenish the material that was scoured away from the channel disposal areas in Test 1, 34,000 cu yd for the upstream bend and 4,000 cu yd for the downstream bend. Tests 3 and 4 each started with the bed remolded to the June 1978 hydrographic survey and the deposit sites filled to the capacity listed for Test 1. Before the beginning of each test, the areas of the navigation channel that did not have adequate depth for navigation were dredged to 9 ft below LWRP. Since most of the area between the river bends was not affected by the disposal of material in the thalweg during the

testing, that section was not included on the plates showing the results of the thalweg disposal testing.

Results

13. The results of Tests 1-3 (Plates 9-11, respectively) indicated that little change would occur in the crossing elevations due to dredged material being deposited in the bends. Although all of the material moved out of the upper bend during each hydrograph reproduction, it did not increase the shoaling problem observed after the base test. The results of Test 4 (Plate 12) indicated that more shoaling would occur during the high-water year than in the typical water year at Bristol Landing (mile 80.3) and in the lower bend just below the deposit site (miles 76.8 to 76.3) (compare Plate 9 with Plate 12). This increase in shoaling was due to the large amount of deposited material moving out of the bends during the extreme flood flows. Dredging required in the model to reestablish a channel with adequate dimensions for navigation after Tests 1-3 was about the same as for the base test. A significant increase in dredging was required to reestablish the navigation channel after Test 4. It should also be noted that the amount of material that the lower bend would hold was only about half of the yearly average of the amount dredged in the area upstream of the deposit site. This material eroded slowly except during high discharge flows; therefore, the lower bend would have only limited use as a disposal site.

## Within-Bank Disposal Tests

Description

14. Within-bank disposal tests consisted of placing dredged material along the bank adjacent to the dredge cut from the tree line to within 100 ft of the navigation channel. The elevation of the top of the disposal areas was 5 ft above LWRP. All of the tests began with the shoaled areas of the navigation channel dredged to a depth of 9 ft below LWRP. The quantity of material placed in the disposal areas was varied from 1 year's average dredging to the total for 4 years' average dredging, which equates to the maximum storage capacity of the sites in this reach for the model. The conditions used for each test were as follows:

a. Test 1. The bed was molded to the June 1978 hydrographic survey, and material equivalent to the average quantity dredged in 1 year was deposited in all the disposal sites. The 1973-1974 typical water-year hydrograph was reproduced.

b. Test 2. The ending bed configuration from Test 1 was used, and shoaled areas were dredged where necessary to obtain authorized channel width and depth. One year's average dredging quantity was added to the disposal sites. The 1973-1974 typical water-year hydrograph was reproduced for this test.

c. Test 3. The bed was molded to the June 1978 survey, and material equivalent to the average quantity dredged in 1 year was deposited in all the disposal sites. The 1977-1978 high-water-year hydrograph was reproduced for this test.

d. Test 4. The bed was molded to the June 1978 survey, and material equivalent to the average quantity dredged in 2 years was deposited in all the disposal sites. The 1973-1974 typical water-year hydrograph was reproduced for this test.

e. Test 5. The bed was molded to the June 1978 survey, and material equivalent to the average quantity dredged in 4 years was deposited in all disposal sites, except for the site at mile 80.7, where only the equivalent to the quantity dredged in 2 years was required to fill the area to maximum storage capacity. The 1973-1974 typical water-year hydrograph was reproduced for this test.

f. Test 6. The same initial conditions as those for Test 5 were used, except the 1977-1978 high-water-year hydrograph was reproduced for this test.

g. Test 7. The starting bed configuration for this test was the ending bed configuration for Test 6. Only the three peak discharges from the 1977-1978 high-water-year hydrograph (135,000, 70,000, and 61,000 cfs) were reproduced for the model equivalent of 20 days each to simulate the effects of extended high water.

## Results

15. The results of within-bank disposal Tests 1-4 indicate little change in the shoaling tendencies compared to the base test. The bed condition shown in Plate 13 is typical of each of the tests. There was some erosion of material along the channel edge of the disposal sites, but this shoaling was not significant enough to cause additional shoaling problems.

16. The results of Test 5 (Plate 14) indicated the channel would improve in the reaches opposite the disposal sites. The deposited material appeared to act as a low-water dike by contracting the overall channel. A wider, deeper navigation channel then developed. However, the deposited material showed more tendency for erosion along the channel edge than in Tests 1-4, but no additional tendency for shoaling in the navigation channel due to this material was indicated. The increased erosion was due to the contracted channel increasing the velocities along the channel edge of the deposit sites. No dredging was required following this test except for the

crossing at mile 77.4, which required about the same amount of dredging as that required following the base test.

17. The results of high-water Tests 6 and 7 (Plates 15 and 16, respectively) indicated that the channel would not widen or deepen as in Test 5 and with one exception, shoaling in the navigation channel was approximately equivalent to that indicated in the base test. The area from miles 77.6 to 77.3 shoaled about 2-4 ft higher than in the base test, which resulted in significantly greater required total dredging following Test 7 (compare Plate 7 with Plate 16). Very little erosion of the disposal areas was noted except along the extreme channel edge of the areas of disposal.

18. The overall results of within-bank disposal testing indicated that disposal of dredged material inside the waterline is feasible until the capacity of the storage area is reached. Capacity is defined as being the maximum amount of dredged disposal material that can be placed on the adjacent bank of a dredged channel without exceeding the established constraints of material being placed no closer than 100 feet to the navigation channel and to an elevation no higher than 5 feet above LWRP. Erosion of the dredged disposal material from the deposit sites was much less by volume than the amount that is annually dredged from the navigation channel and deposited at the sites. The amount of dredging required to maintain the navigation channel was not significantly changed until the disposal sites had been completely filled. Once these sites were filled, the amount of dredging required to maintain the channel was lower except for the channel crossing at mile 77.4. Following high-water years, dredging requirements for the channel crossing from miles 77.6 to 77.3 increased significantly over those of the base test.

## Channel Contraction Works

### Plan A

19. Description. Plan A (Plate 17) was a system of dikes proposed by the US Army Engineer District, Mobile, to develop and maintain an adequate navigation channel. The system consisted almost exclusively of spur dikes. The only exception was an L-head dike at the entrance to Rysco Shipyard at mile 77.5. A total of 23 dikes were used for Plan A. Plan A-14 (Plate 18) was the last modification made to the original plan (Plan A). The intervening plans modified Plan A by adding additional dikes, raising the elevations of the dikes, changing the dike lengths, and modifying existing dikes. A total

of 32 dikes were added, 8 existing prototype dikes modified, and one existing prototype dike removed for Plan A-14.

20. Results. None of the plans tested for Plans A through A-14 reduced the dredging required to maintain the navigation channel significantly. Dredging to maintain adequate depth and alignment was required from miles 80.0 to 76.9 except for an area between miles 78.2 and 77.85. Dike locations, lengths, and elevations for Plan A-14 are shown in Table 1.

## Plan B

21. Description. Plan B was a progressive development of a dike system to develop and maintain the navigation channel by a combination of spur and L-head dikes. Plan B-14 was the final plan developed for the entire reach. The results of the preliminary testing are not described in this report since these tests were for plan development only. Plan B-14 began with the model bed remolded to the 1978 prototype bed configuration and used the dike system locations, lengths, and elevations listed in Table 2. The model was operated for four tests. Runs 1 and 2 (Plate 19) used the 1973-1974 typical water-year hydrograph, Run 3 (Plate 20) used the 1977-1978 high-water-year hydrograph, and Run 4 (Plate 21) used the 1967-1968 low-water-year hydrograph. A total of 11 dikes were added, 7 existing prototype dikes were modified, and 2 existing prototype dikes were left as is.

22. Results. Test results indicated that the system of dikes installed and the modifications made to existing prototype dikes in Plan B-14 would maintain the navigation channel during typical water years (Plate 19) except for the channel crossing at mile 77.4, where the channel shoaled about 1-3 ft higher than minimum navigation depth. Test results of Plan B-14, Run 3, using the high-water hydrograph (Plate 20), indicated that the channel would maintain itself except for the crossing at mile 77.4, where there was shoaling of about 4 ft above minimum navigation depth, a reduction of approximately 90 percent over annual dredging required. Testing of Plan B-14, Run 4, using the low-water hydrograph (Plate 21), indicated that the channel would still maintain itself except for the crossing at mile 77.4, where shoaling of from 2 to 4 ft above minimum navigation depth occurred. Since the model adjustment for the area at mile 77.4 was from 2 to 4 ft higher than prototype, it is probable that the prototype shoaling will be less than indicated by the model.

## PART IV: CONCLUSIONS

23. The limitations of the model in reproducing all of the factors affecting developments in the reach and the differences between the model and prototype indicated by the results of the verification tests must be considered in the evaluation of model results. The model was not able to reproduce all the overbank area in which flow passes during flood stages. In spite of these limitations, adjustment and verification of the model were sufficient to indicate trends that can be expected under the conditions imposed for each plan or modification tested and the relative effectiveness of each plan.

24. Conclusions reached from the dredged material disposal study are summarized as follows:

- a. Thalweg disposal of dredged material had little effect on the dredging required following reproduction of the low- and typical-water hydrographs, but maintenance dredging significantly increased following reproductions of the high-water hydrograph.
- b. Disposal material placed in the thalweg of the upper bend (miles 80.9 to 80.7) was almost completely eroded during reproduction of each typical hydrograph, but the disposal material placed in the lower bend (miles 77.3 to 76.6) tended to remain in place during all tests except for the reproductions of the high-water hydrograph.
- c. Within-bank disposal of dredged material equivalent to twice the average prototype quantity dredged in this area had little effect on dredging required following reproduction of the low- and typical-water hydrographs.
- d. Filling within-bank disposal areas to their capacity, which is equivalent to four times the average quantity annually dredged, improved the navigation channel dimensions and decreased the dredging required following reproduction of the low- and typical-water hydrographs.
- e. Required dredging increased significantly following reproduction of the high-water hydrograph with the within-bank disposal areas completely filled.
- f. Once filled, within-bank disposal areas provided little additional capacity for dredged material as the material in these areas tended to erode slowly.

25. The spur dike system of Plan A-14 will not develop and maintain an adequate navigation channel.

26. The L-head dike system (Plan B-14) developed and maintained an adequate navigation channel throughout the model reach except in the channel

crossing at mile 77.4. Results of the model adjustment indicated that the shoaling in this area of the model would be exaggerated; therefore, the shoaling was not considered significant.

Table 1

Blountstown Reach, Navigation Miles 81 to 76, Apalachicola River

Plan A-14 Dikes

| Location Navigation Mile | Type | Length in Prototype Ft | | Elevation* in Prototype Ft | | |
|---|---|---|---|---|---|---|
| | | Spur | L | Spur Root | Spur Channel | L |
| 80.23-80.17L | Angled L-head | 220 | 200 | 45 | 40 | 36 |
| 80.09L | Spur | 300 | | 45 | 36 | |
| 80.01L | Spur | 300 | | 45 | 36 | |
| 79.90L | Spur | 370 | | 45 | 36 | |
| 79.82L | Spur | 370 | | 45 | 36 | |
| 79.75L | Spur | 300 | | 45 | 36 | |
| 79.67L | Spur | 300 | | 45 | 36 | |
| 79.60L | Spur | 300 | | 45 | 36 | |
| 79.52L** | Spur | 200 | | 45 | 34 | |
| 79.46L** | Spur | 180 | | 45 | 33 | |
| 79.46R** | Spur | 150 | | 45 | 36 | |
| 79.40L** | Spur | 150 | | 45 | 35 | |
| 79.40R** | Spur | 200 | | 45 | 35 | |
| 79.34L | Spur | 160 | | 45 | 35 | |
| 79.25L | Spur | 190 | | 45 | 35 | |
| 79.14L | Spur | 200 | | 45 | 35 | |
| 79.04L** | Spur | 250 | | 45 | 40 | |
| 79.00L** | Spur | 250 | | 45 | 40 | |
| 78.94L** | Spur | 300 | | 45 | 40 | |
| 78.81L | Spur | 250 | | 45 | 40 | |
| 78.71L | Spur | 330 | | 45 | 40 | |
| 78.58L | Spur | 400 | | 45 | 40 | |
| 78.45L | Spur | 330 | | 45 | 40 | |
| 78.31L | Spur | 450 | | 45 | 40 | |
| 78.17L | Spur | 460 | | 45 | 40 | |
| 78.06L | Spur | 380 | | 45 | 40 | |
| 77.96-77.87L | Angled L-head | 250 | 300 | 45 | 40 | 40 |
| 77.78L | Spur | 250 | | 45 | 40 | |
| 77.69L | Spur | 320 | | 45 | 40 | |
| 77.60L | Spur | 300 | | 45 | 40 | |
| 77.53L | Spur | 300 | | 45 | 40 | |
| 77.51-77.41R | L-head | 170 | 470 | 30 | 35 | 25† |
| 77.43L | Spur | 300 | | 45 | 40 | |
| 77.35L | Spur | 450 | | 45 | 40 | |
| 77.24L | Spur | 550 | | 45 | 40 | |
| 77.09L | Spur | 550 | | 45 | 40 | |
| 76.74L | Spur | 550 | | 45 | 35 | |
| 76.59L | Spur | 530 | | 45 | 35 | |
| 76.46L | Spur | 570 | | 45 | 35 | |
| 76.30L | Spur | 680 | | 45 | 38 | |

* All elevations (el) are referred to the National Geodetic Vertical Datum (NGVD).
** Existing prototype dike (modified for this plan).
† Entire spur portion at el 30, L section begins at el 35 at the end of the spur and slopes to el 25.

Table 2

Blountstown Reach, Navigation Miles 81 TO 76, Apalachicola River

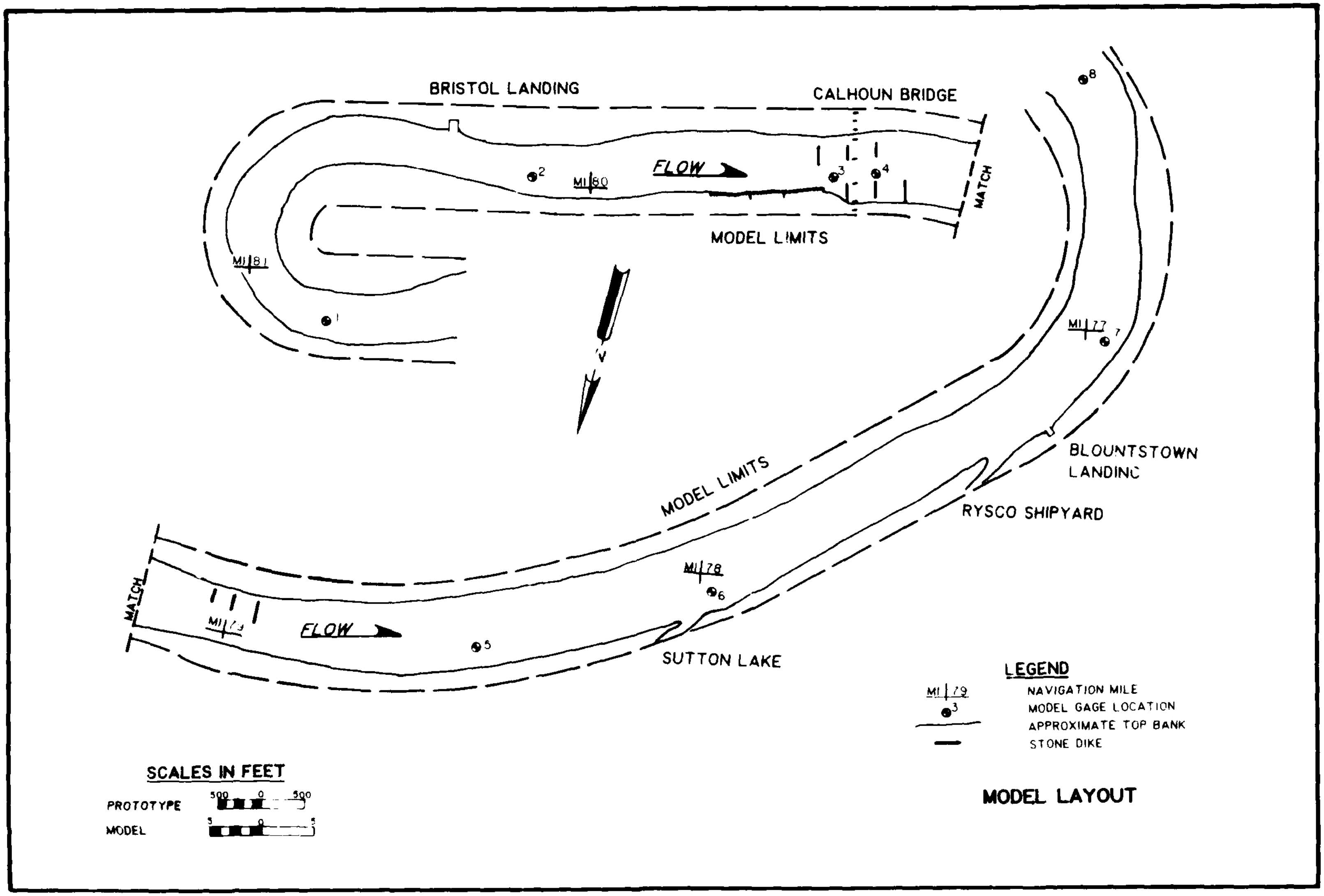
Plan B-14 Dikes

| Location Navigation Mile | Type | Length in Prototype Ft | | Elevation* in Prototype Ft | | |
|---|---|---|---|---|---|---|
| | | Spur | L | Spur Root | Spur Channel | L |
| 80.27-80.18L | Angled L-head | 50 | 375 | 45 | 45 | 40 |
| 79.69-79.62L | L-head | 315 | 350 | 44 | 40 | 40 |
| 79.52L** | Spur | 220 | | 40 | 40 | |
| 79.46L** | Spur | 210 | | 40 | 38 | |
| 79.46R** | Spur | 160 | | 40 | 40 | |
| 79.40L** | Spur | 170 | | 40 | 35 | |
| 79.40R** | Spur | 215 | | 40 | 38 | |
| 79.33R** | Spur | 260 | | 40 | 35 | |
| 79.04L† | Spur | 135 | | 37 | 35 | |
| 79.00L† | Spur | 180 | | 38 | 35 | |
| 78.94-78.87L** | L-head | 230 | 375 | 45 | 40 | 40 |
| 78.70-78.63L | L-head | 350 | 360 | 45 | 40 | 40 |
| 78.41-78.32L | L-head | 410 | 345 | 45 | 40 | 40 |
| 78.15L | Spur | 420 | | 45 | 40 | |
| 77.95-77.87L | Angled L-head | 305 | 295 | 45 | 40 | 40 |
| 77.68L | Spur | 290 | | 45 | 40 | |
| 77.52-77.48L | L-head | 310 | 200 | 45 | 40 | 40 |
| 77.51-77.41R | L-head | 110 | 485 | 25 | 25 | 35-25 |
| 77.35-77.27L | L-head | 345 | 375 | 45 | 43 | 43 |
| 76.74-76.68L | L-head | 440 | 320 | 45 | 40 | 38 |

* All elevations (el) are referred to the National Geodetic Vertical Datum (NGVD).

** Existing prototype dike (modified for this plan).

† Existing prototype dike (unmodified).




MODEL LAYOUT

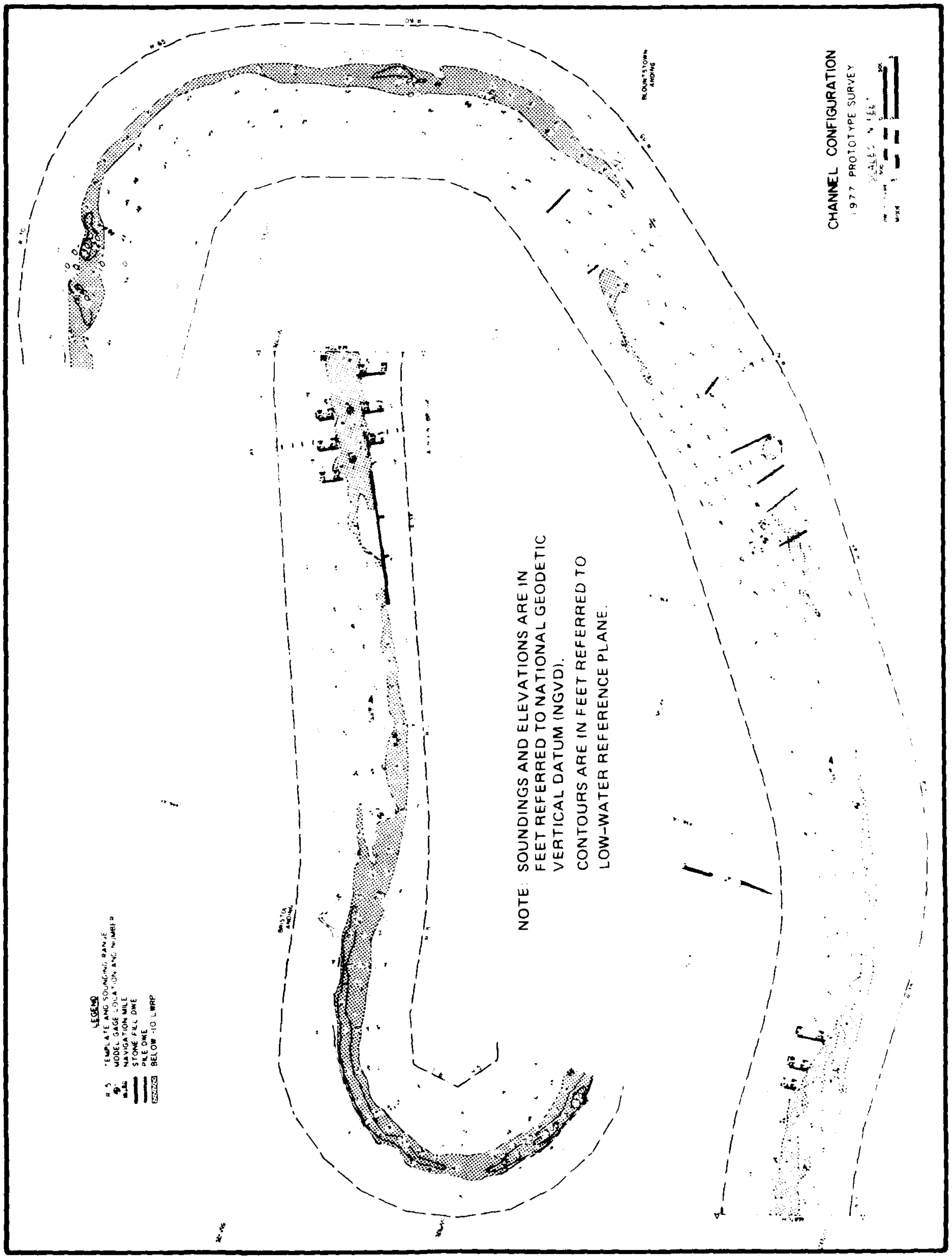
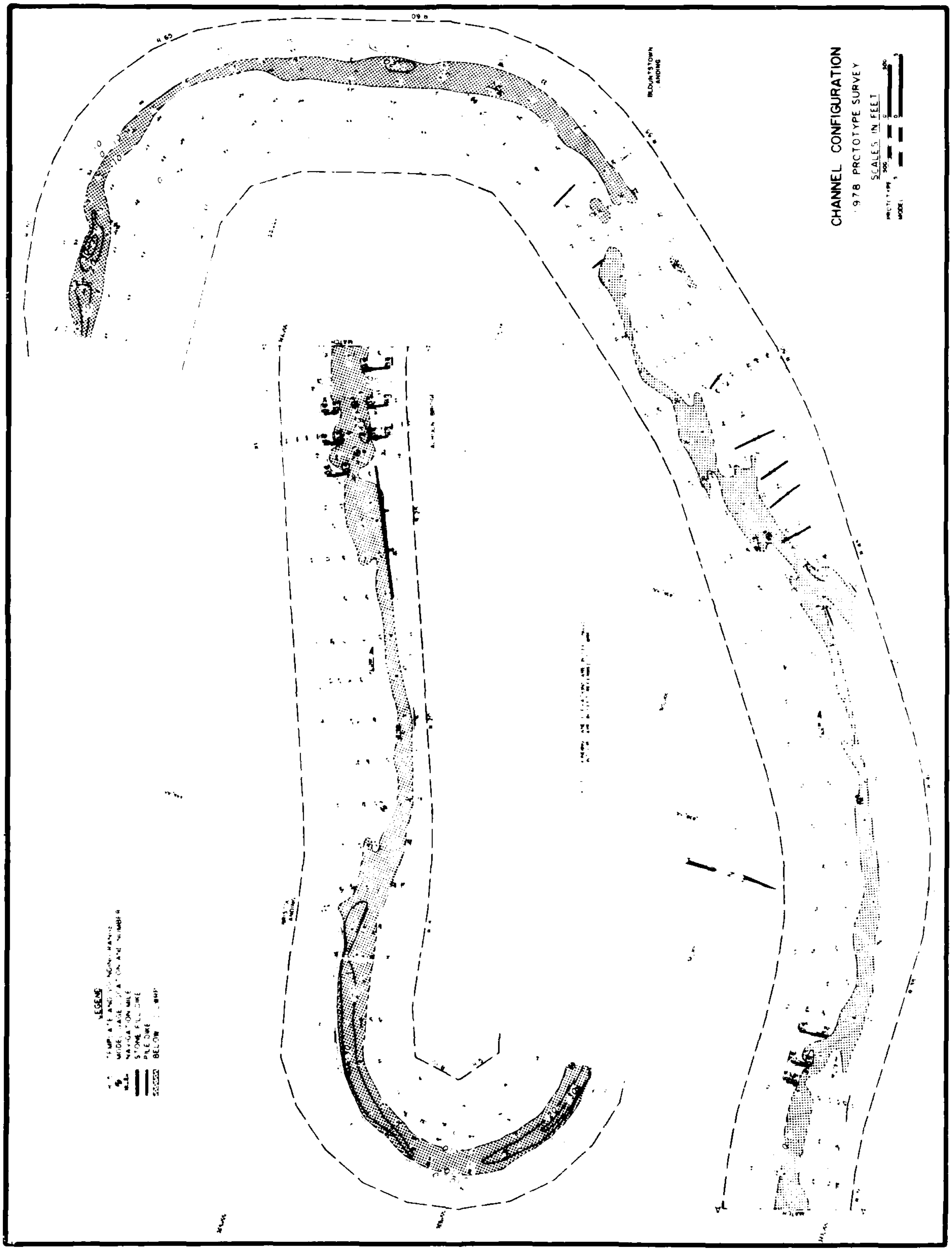
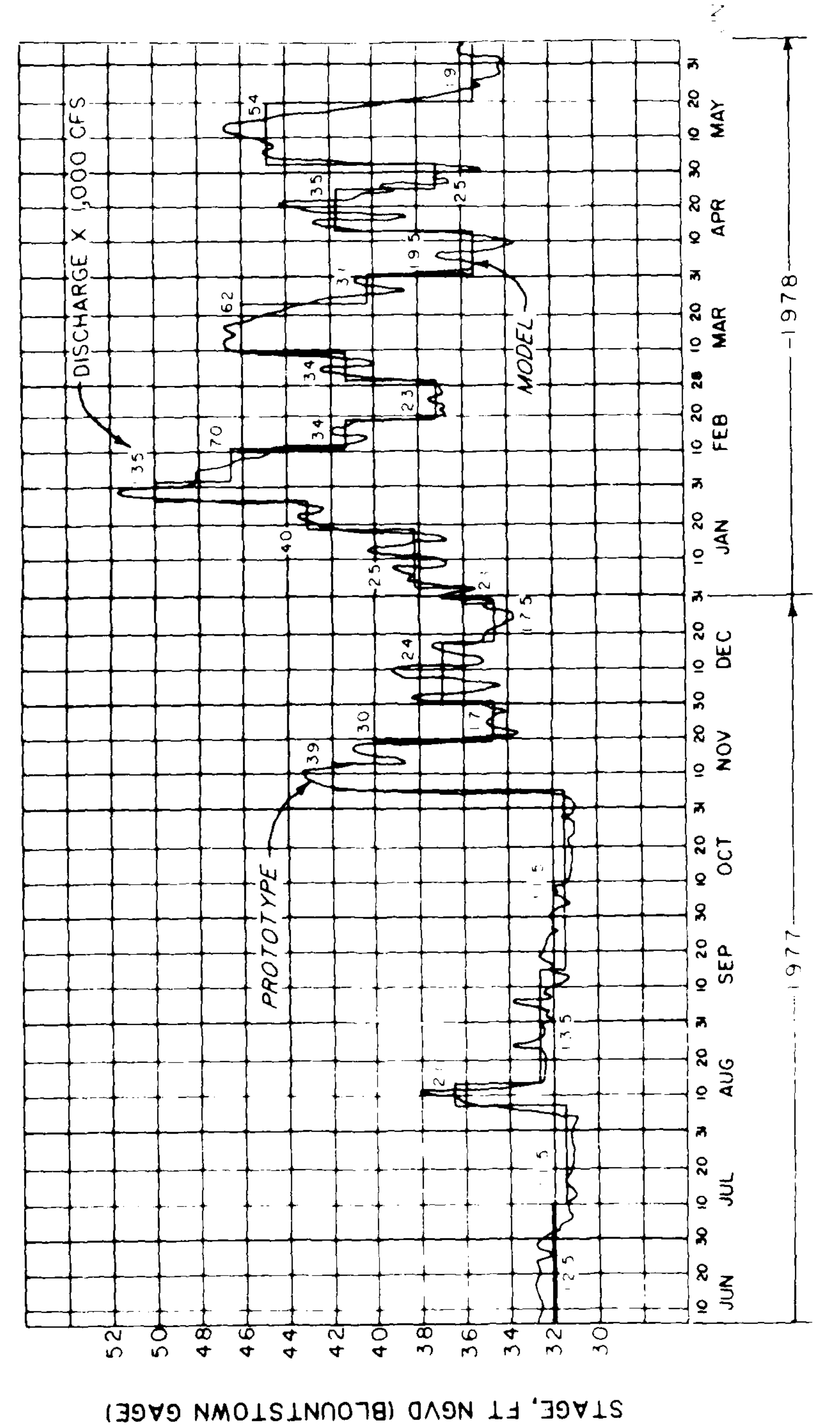

CHANNEL CONFIGURATION
1977 PROTOTYPE SURVEY
NOTE: SOUNDINGS AND ELEVATIONS ARE IN FEET REFERRED TO NATIONAL GEODETIC VERTICAL DATUM (NGVD).
CONTOURS ARE IN FEET REFERRED TO LOW-WATER REFERENCE PLANE.
LEGEND
BLOUNTSTOWN LANDING

PLATE 2


CHANNEL CONFIGURATION
1978 PROTOTYPE SURVEY
SCALES IN FEET
PROTOTYPE
MODEL
BLOUNTSTOWN LANDING
LEGEND
NAVIGATION MILE
STONE FILL DIKE
PILE DIKE




**ADJUSTMENT & HIGH-WATER HYDROGRAPH**

PLATE 4

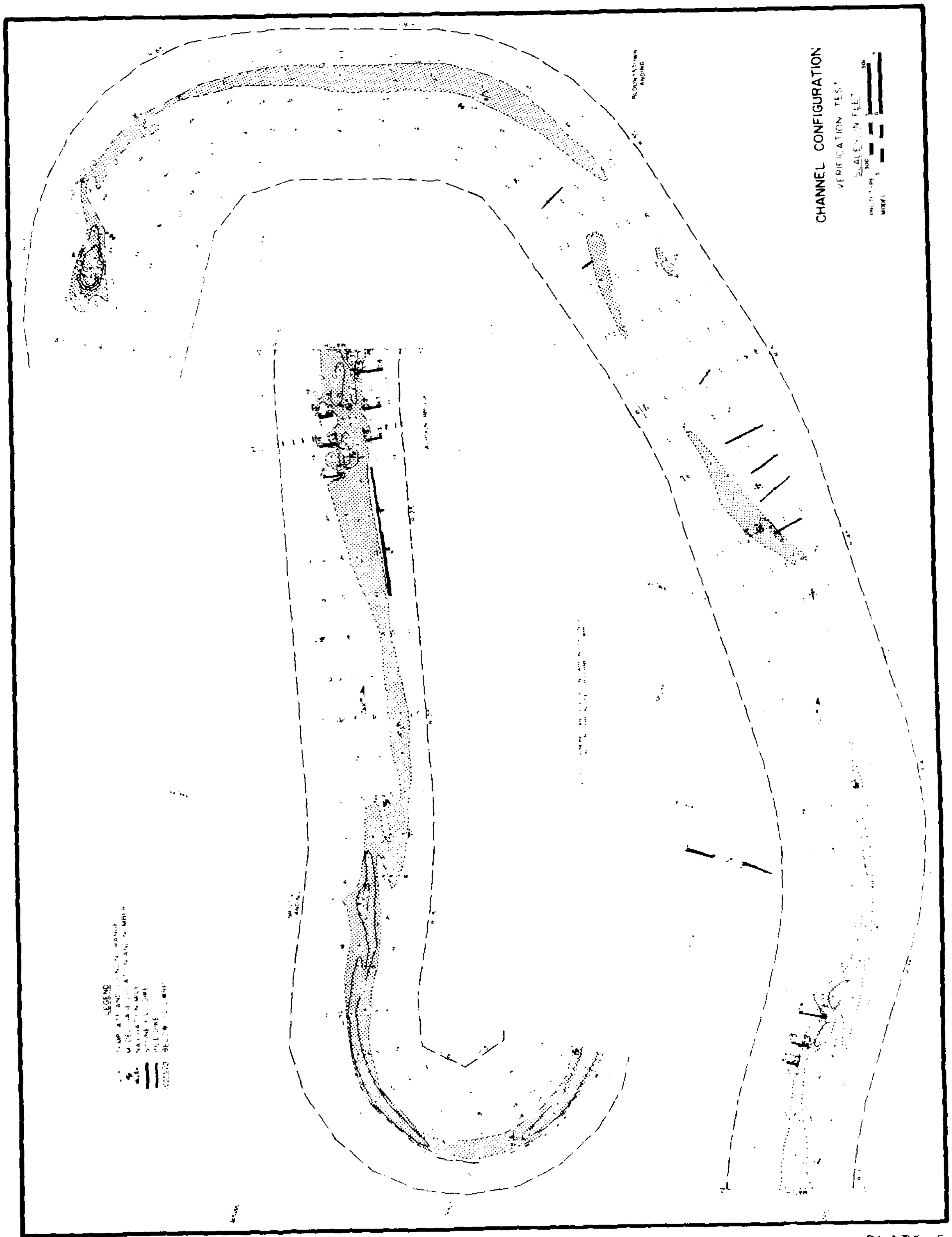
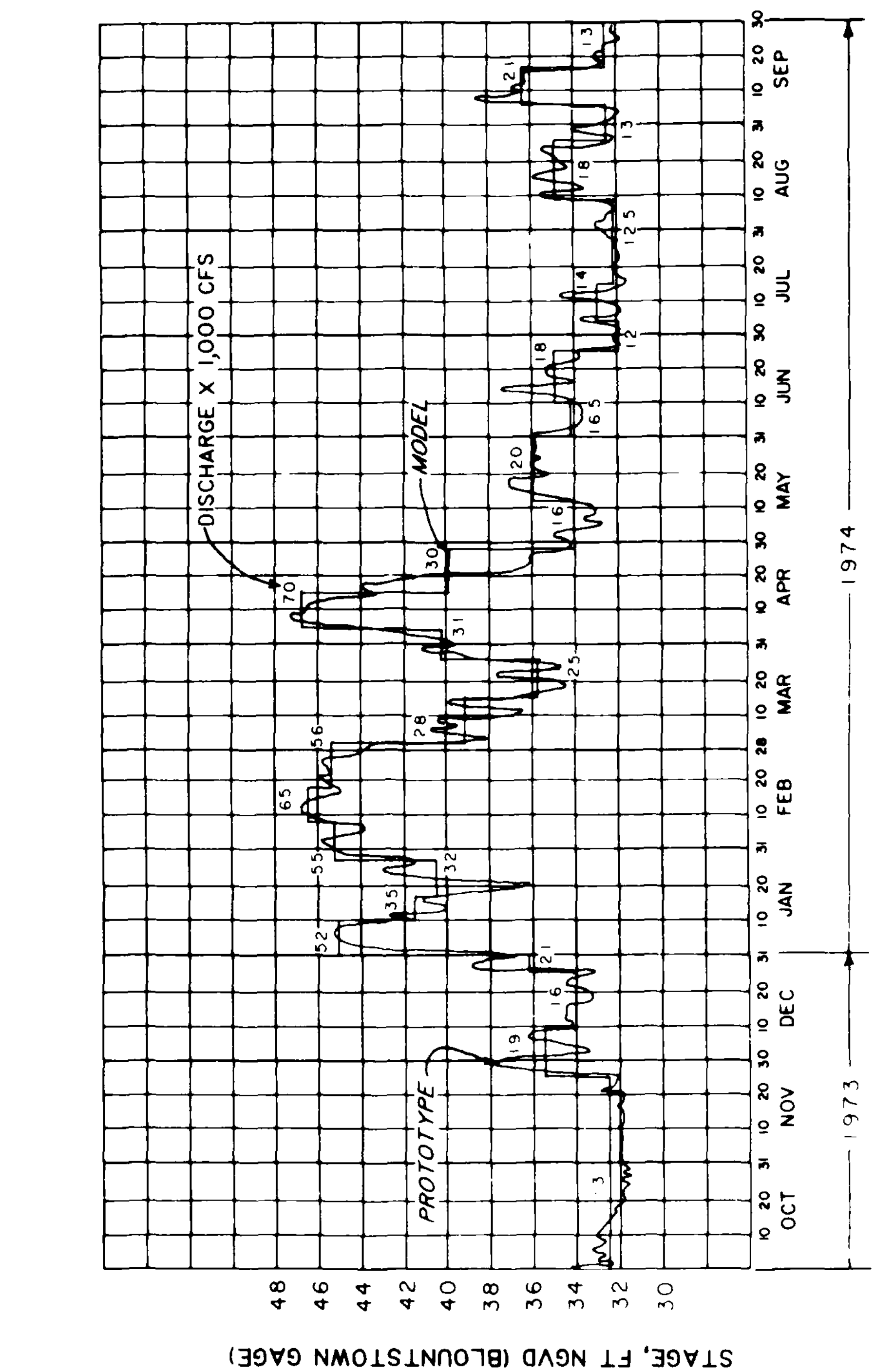



PLATE 5




TYPICAL WATER-YEAR
HYDROGRAPH

PLATE 6

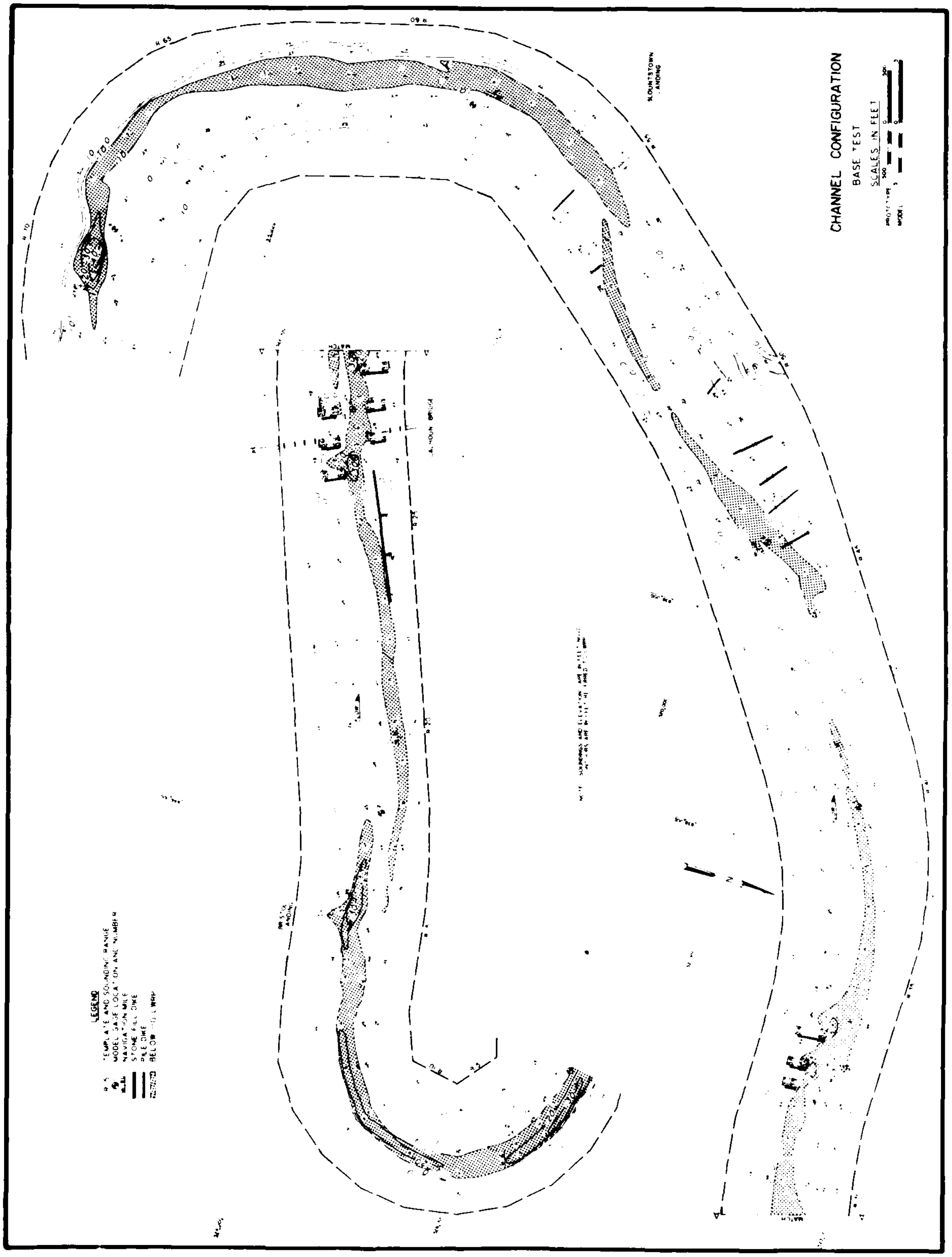



PLATE 7

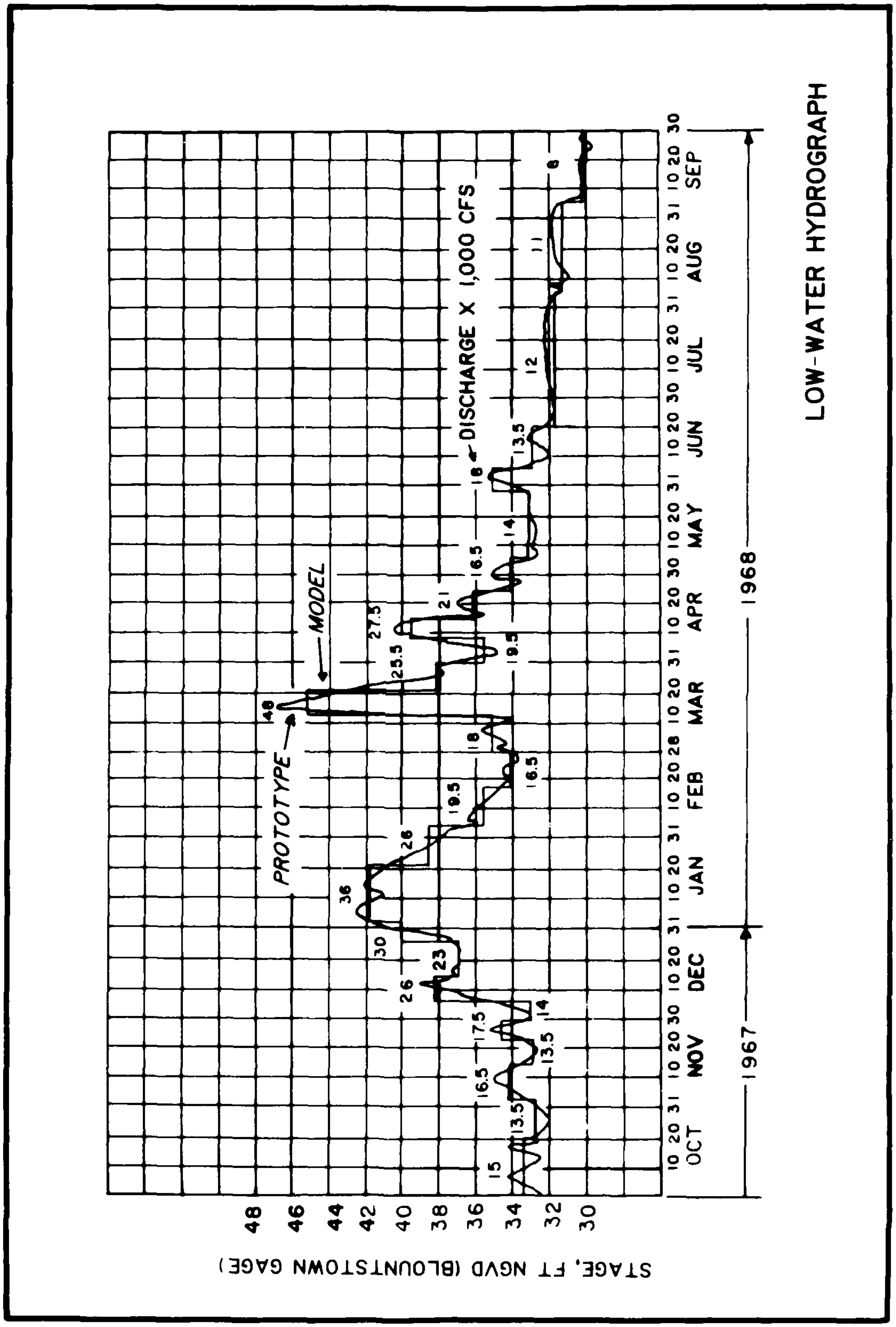

LOW-WATER HYDROGRAPH
STAGE, FT NGVD (BLOUNTSTOWN GAGE)
48
46
44
42
40
38
36
34
32
30
PROTOTYPE
MODEL
DISCHARGE X 1,000 CFS
15
13.5
16.5
17.5
13.5
14
26
23
30
36
26
19.5
16.5
18
48
25.5
27.5
19.5
21
16.5
14
18
13.5
12
11
8
10 20 31 OCT
10 20 30 NOV
10 20 31 DEC
10 20 31 JAN
10 20 28 FEB
10 20 31 MAR
10 20 30 APR
10 20 31 MAY
10 20 30 JUN
10 20 31 JUL
10 20 31 AUG
10 20 30 SEP
1967
1968

PLATE 8

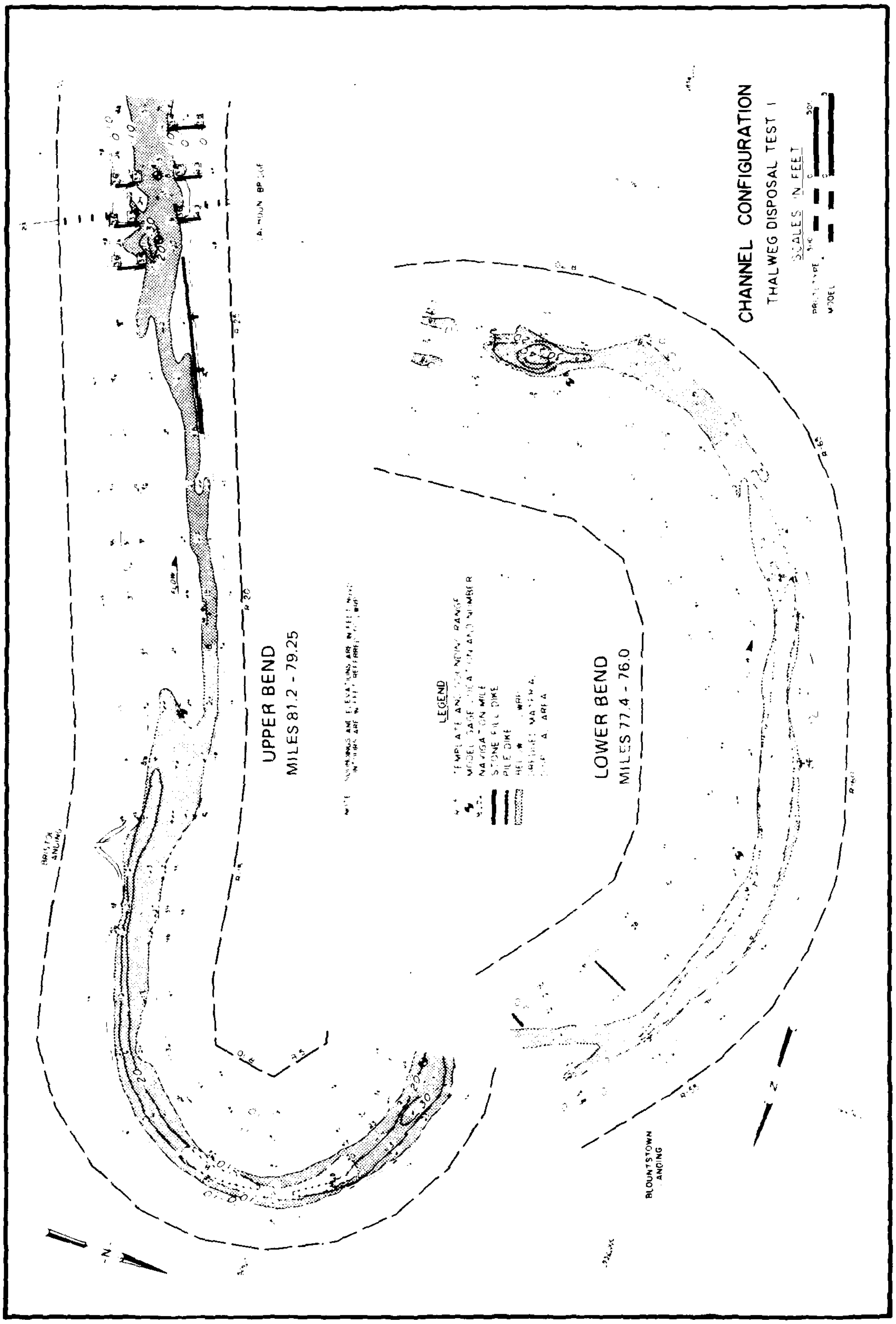

CHANNEL CONFIGURATION
THALWEG DISPOSAL TEST 1
SCALES IN FEET
UPPER BEND
MILES 81.2 - 79.25
LOWER BEND
MILES 77.4 - 76.0
LEGEND
BLOUNTSTOWN LANDING

PLATE 9

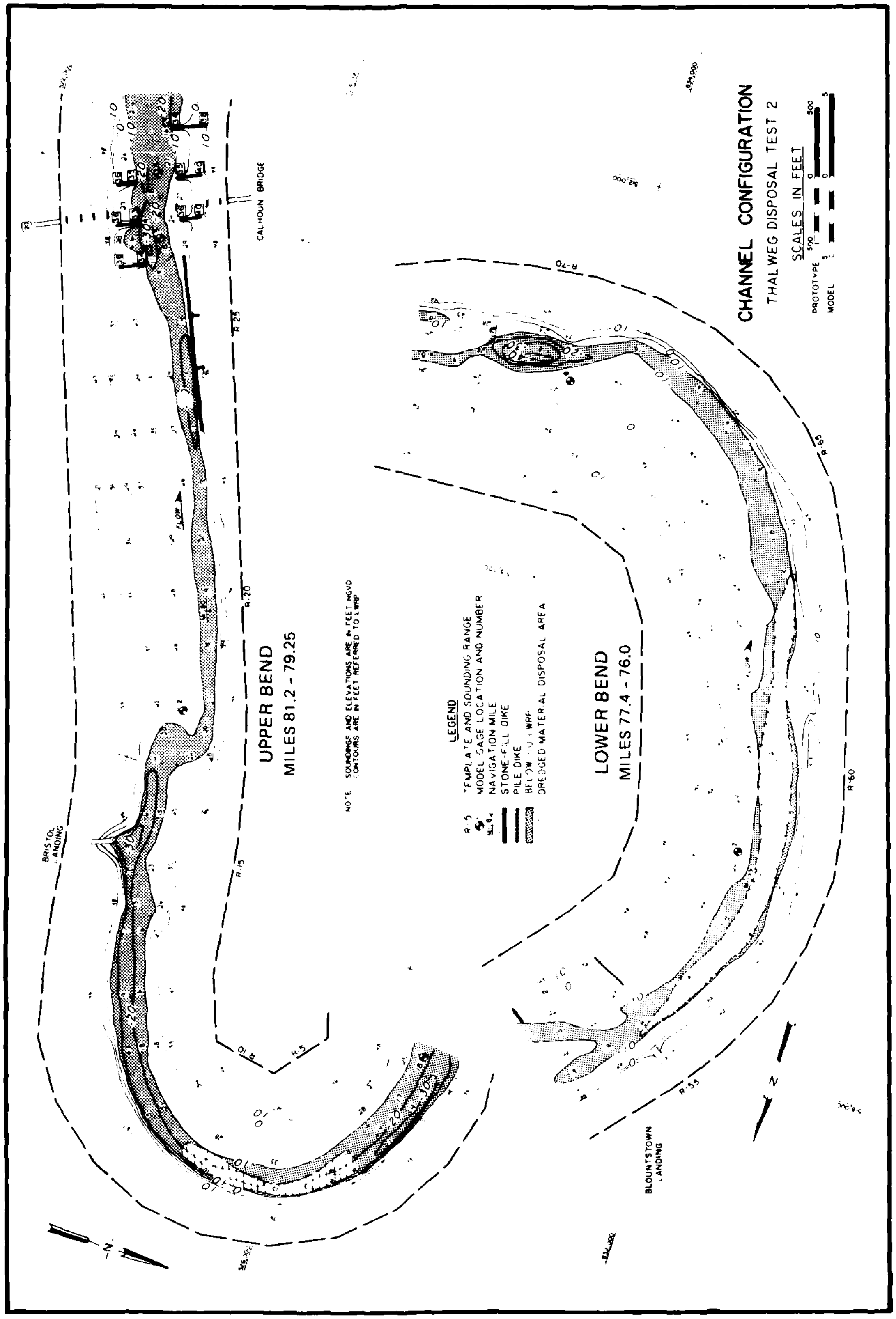

CHANNEL CONFIGURATION
THALWEG DISPOSAL TEST 2
SCALES IN FEET
PROTOTYPE
MODEL
CALHOUN BRIDGE
UPPER BEND
MILES 81.2 - 79.25
LOWER BEND
MILES 77.4 - 76.0
LEGEND
TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
DREDGED MATERIAL DISPOSAL AREA
NOTE SOUNDINGS AND ELEVATIONS ARE IN FEET NGVD CONTOURS ARE IN FEET REFERRED TO LWRP
FLOW
BRISTOL LANDING
BLOUNTSTOWN LANDING
N

PLATE 10

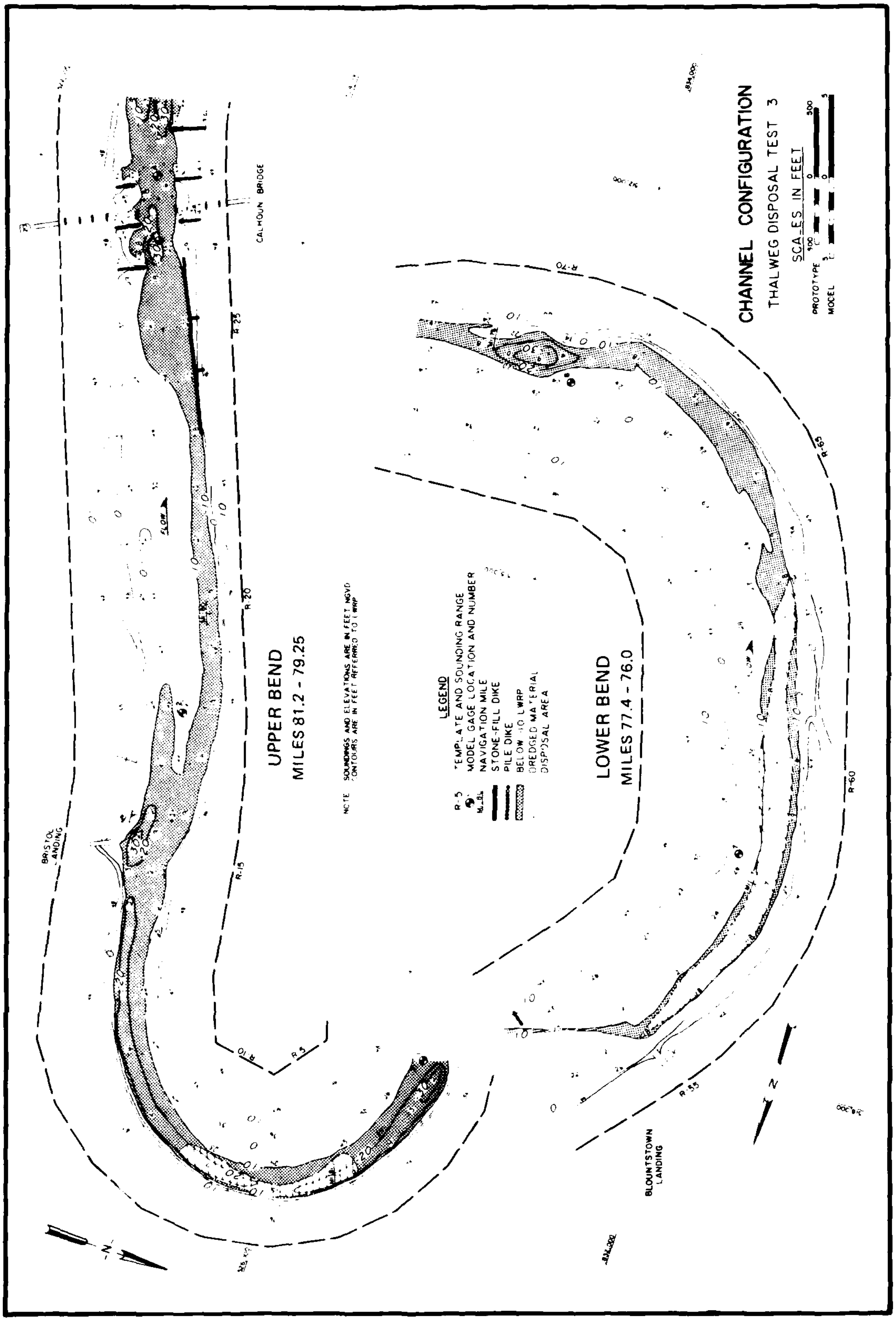
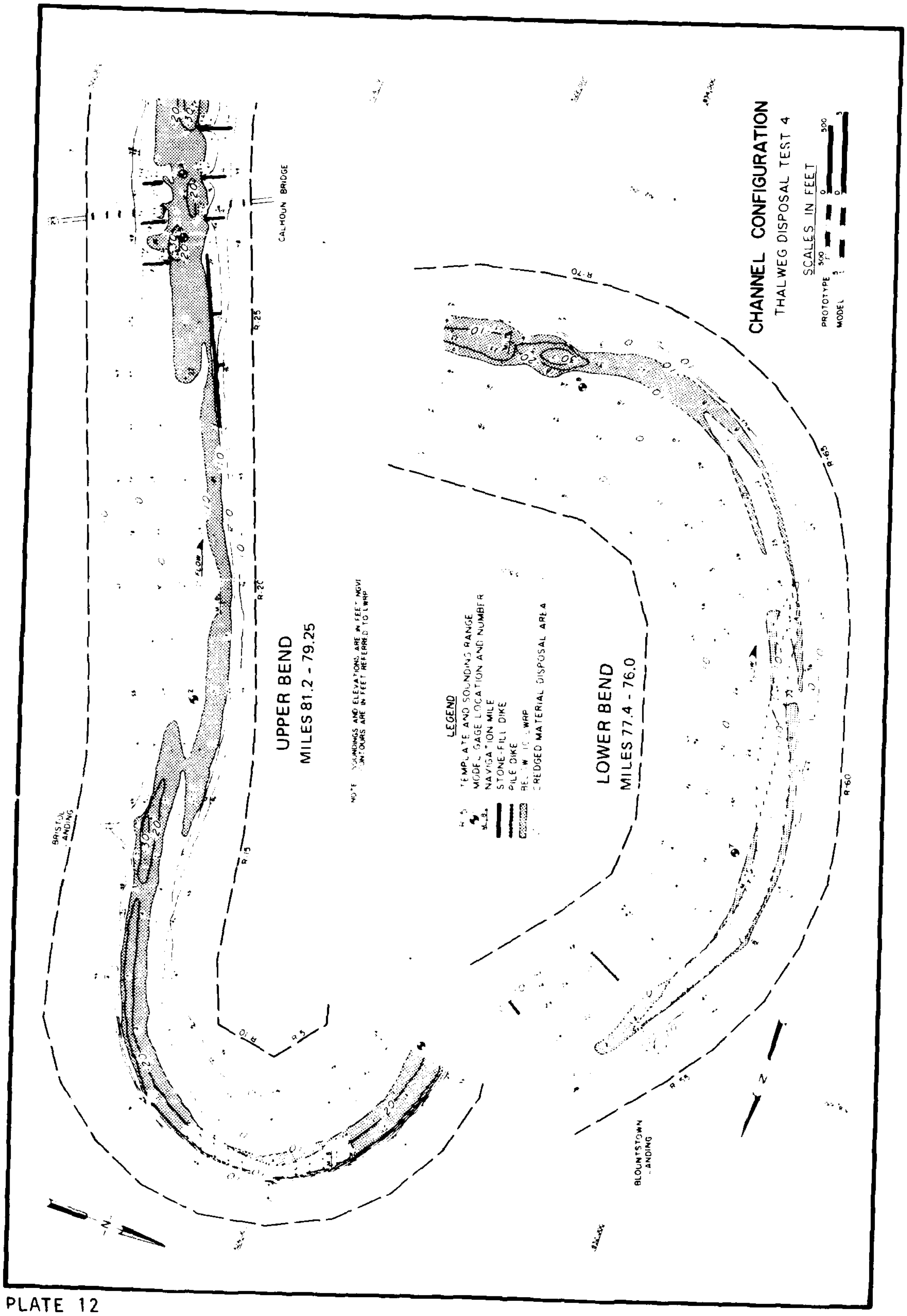

CHANNEL CONFIGURATION
THALWEG DISPOSAL TEST 3
SCALES IN FEET
PROTOTYPE
MODEL
UPPER BEND
MILES 81.2 - 79.25
LOWER BEND
MILES 77.4 - 76.0
NOTE SOUNDINGS AND ELEVATIONS ARE IN FEET NGVD CONTOURS ARE IN FEET REFERRED TO LWRP
LEGEND
R-5 TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
BELOW -10 LWRP
DREDGED MATERIAL DISPOSAL AREA
CALHOUN BRIDGE
BRISTOL LANDING
BLOUNTSTOWN LANDING
FLOW

PLATE 11



CHANNEL CONFIGURATION
THALWEG DISPOSAL TEST 4
SCALES IN FEET
PROTOTYPE
MODEL
UPPER BEND
MILES 81.2 - 79.25
LOWER BEND
MILES 77.4 - 76.0
LEGEND
TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
DREDGED MATERIAL DISPOSAL AREA
CALHOUN BRIDGE
BRISTOL LANDING
BLOUNTSTOWN LANDING
FLOW
N


PLATE 12

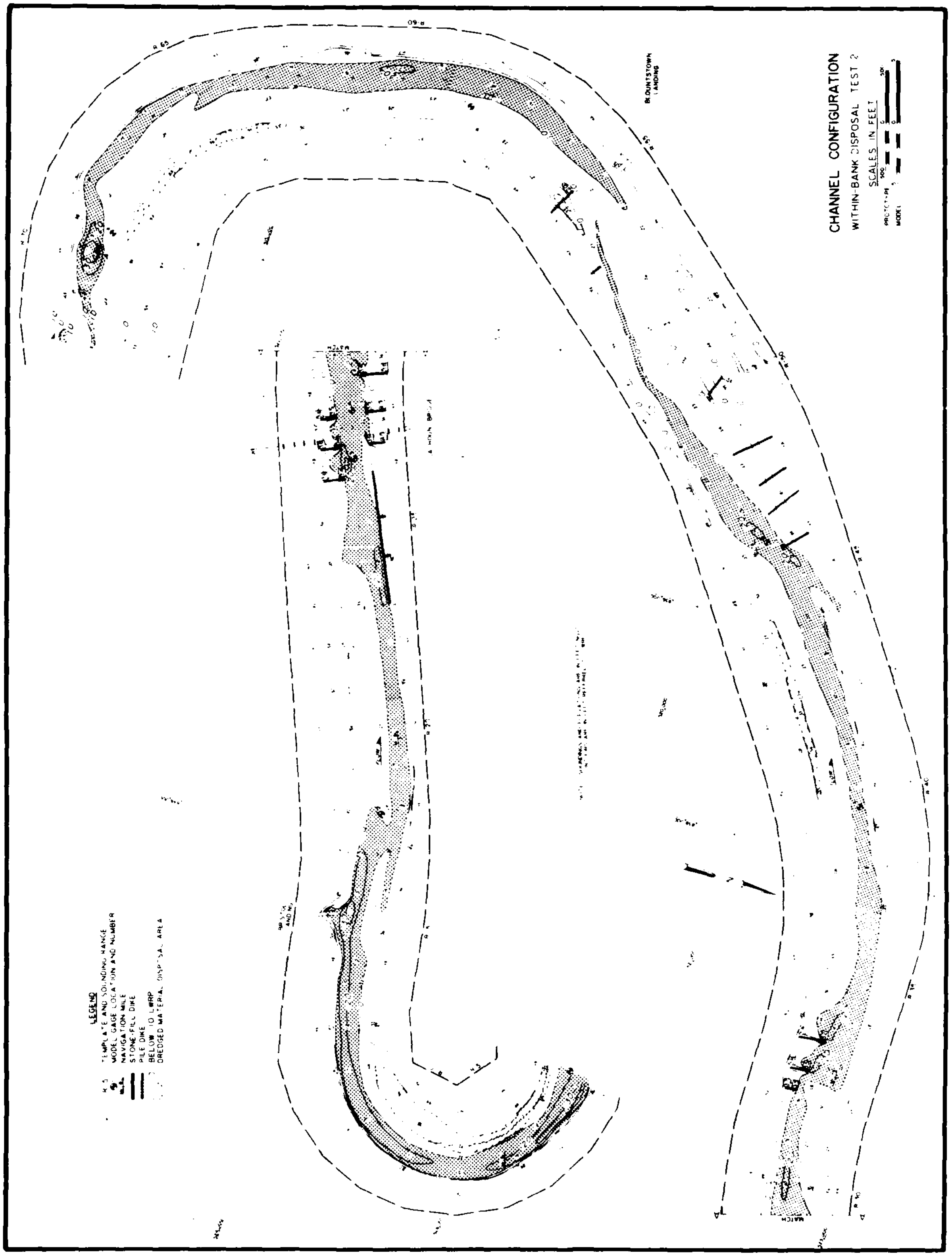

CHANNEL CONFIGURATION
WITHIN-BANK DISPOSAL TEST 2
SCALES IN FEET
PROTOTYPE
MODEL
BLOUNTSTOWN LANDING
LEGEND
TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
BELOW 10 LWRP
DREDGED MATERIAL DISPOSAL AREA
MATCH

PLATE 13

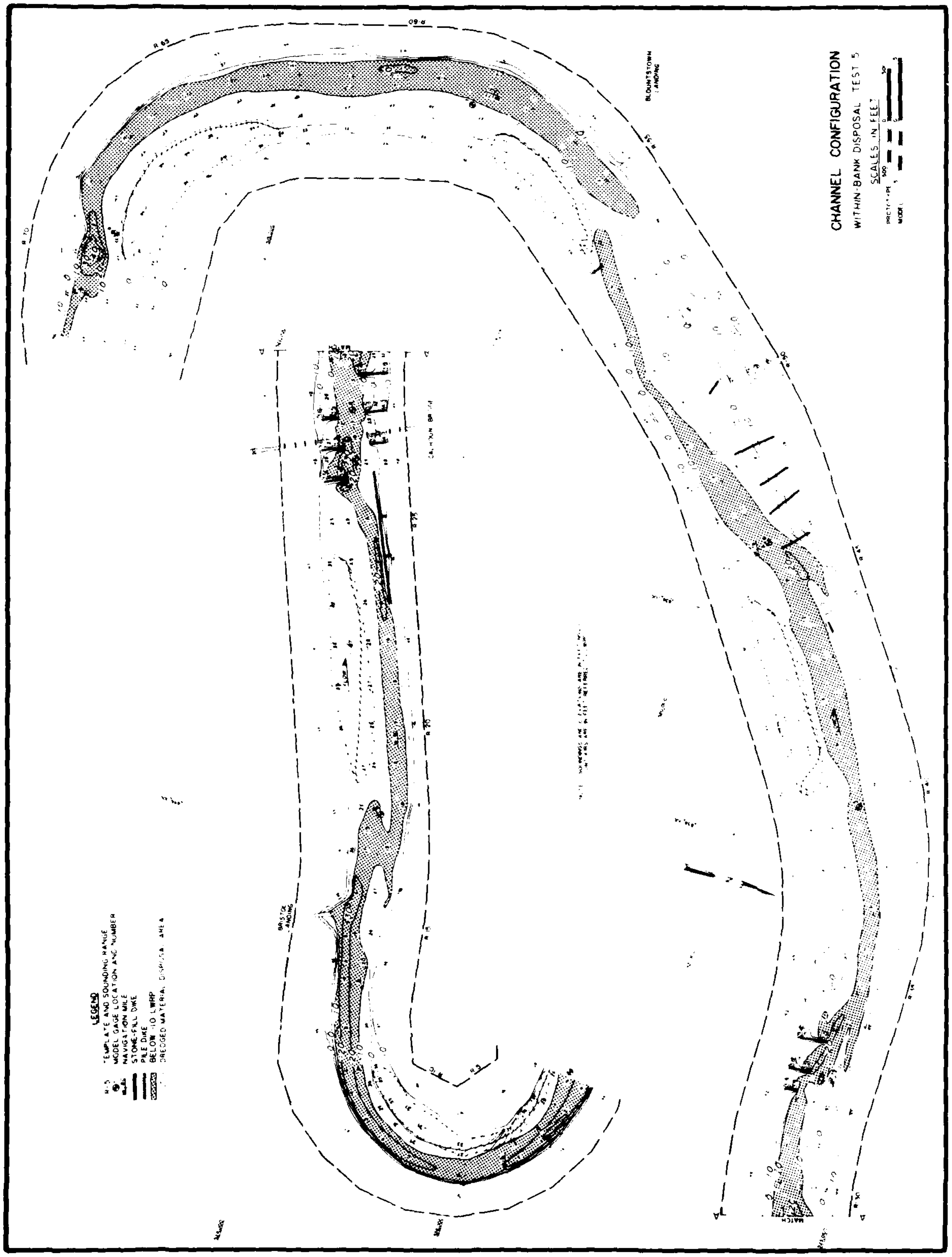
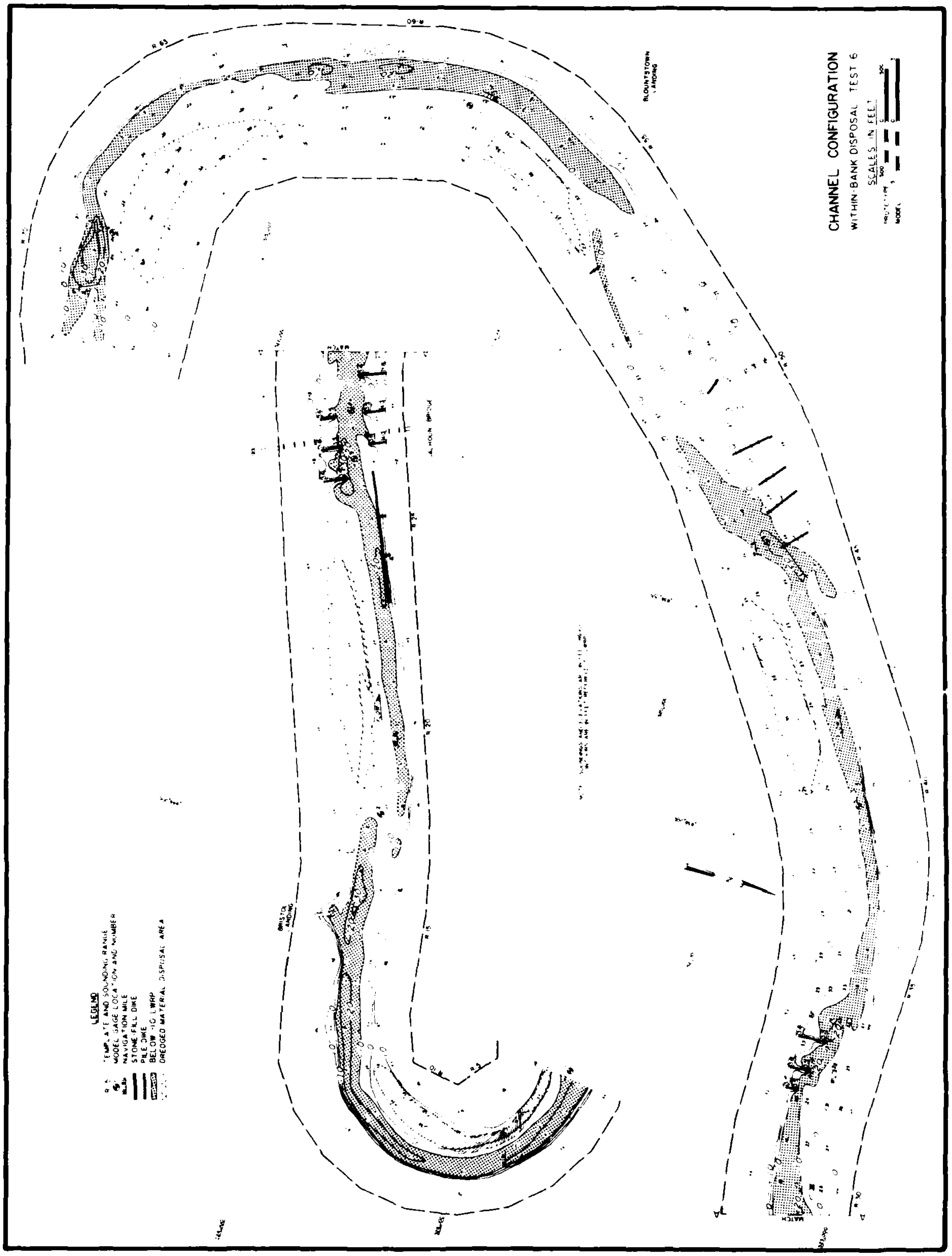

CHANNEL CONFIGURATION
WITHIN-BANK DISPOSAL TEST 5
SCALES IN FEET
PROTOTYPE
MODEL
BLOUNTSTOWN LANDING
LEGEND
TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
BELOW -10 LWRP
DREDGED MATERIAL DISPOSAL AREA
MATCH

PLATE 14


CHANNEL CONFIGURATION
WITHIN-BANK DISPOSAL TEST 6
SCALES IN FEET
BLOUNTSTOWN LANDING
BRISTOL LANDING
LEGEND
TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
BELOW +10 LWRP
DREDGED MATERIAL DISPOSAL AREA
MATCH

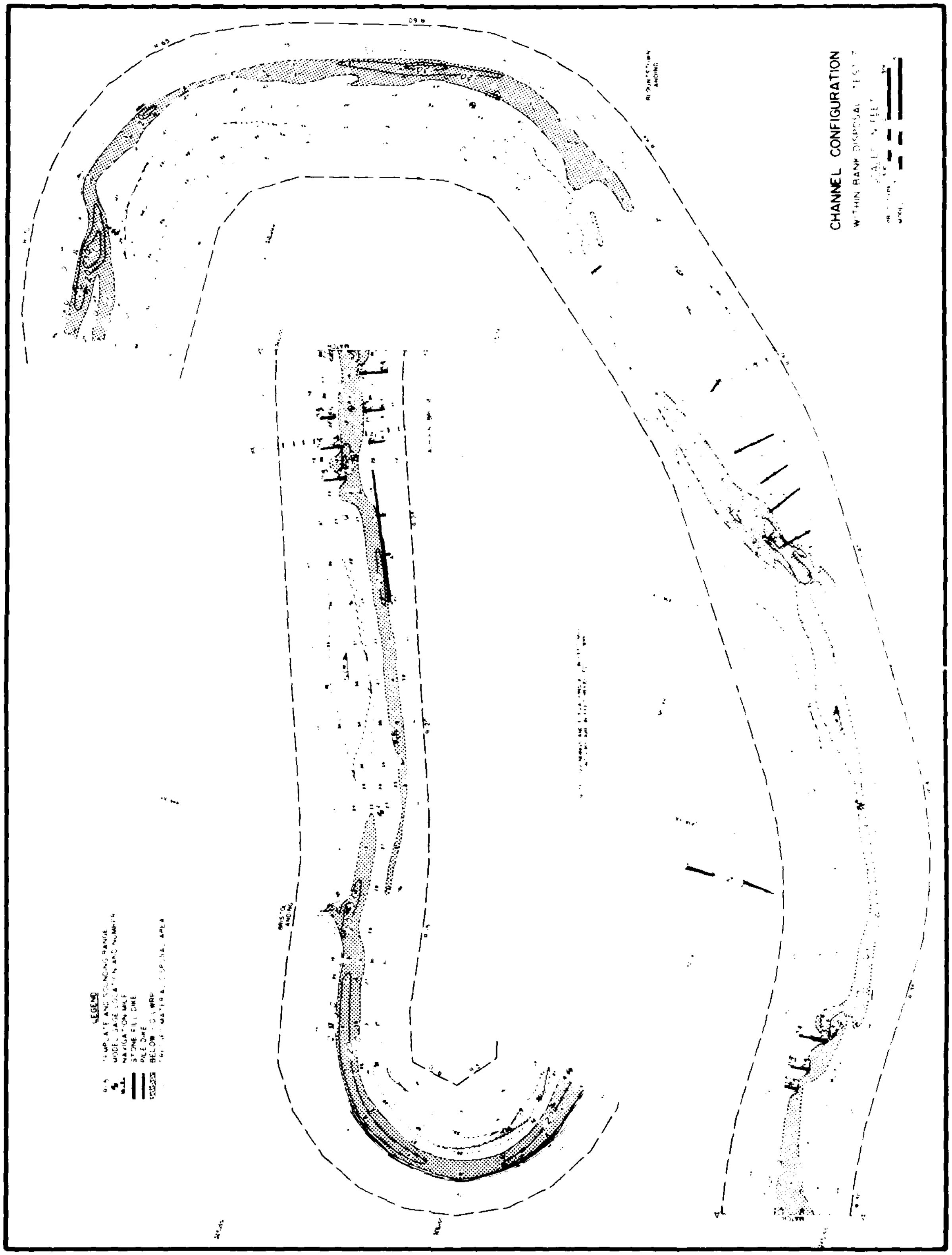
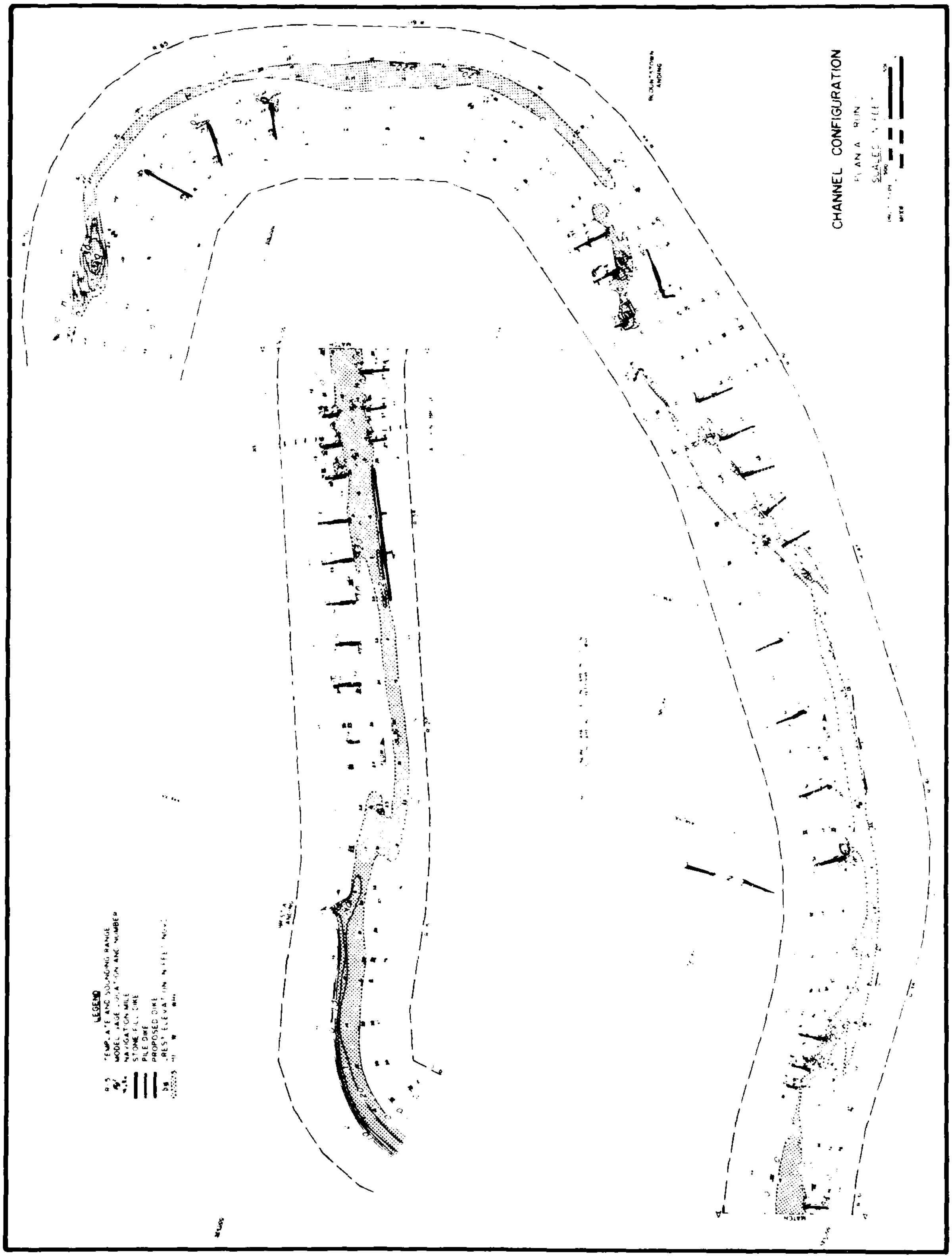



PLATE 16



CHANNEL CONFIGURATION
LEGEND
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
PILE DIKE
PROPOSED DIKE


PLATE 17

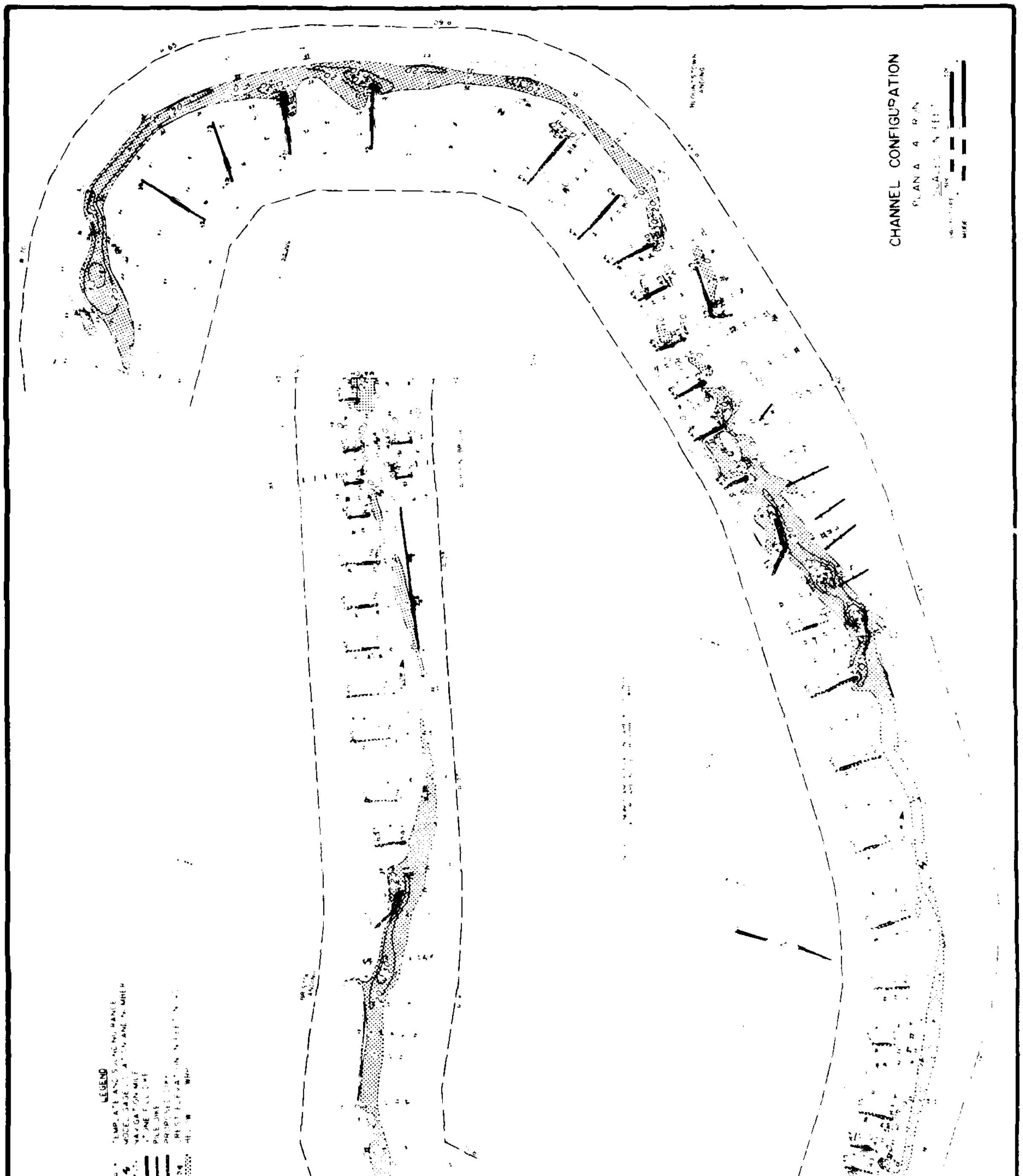
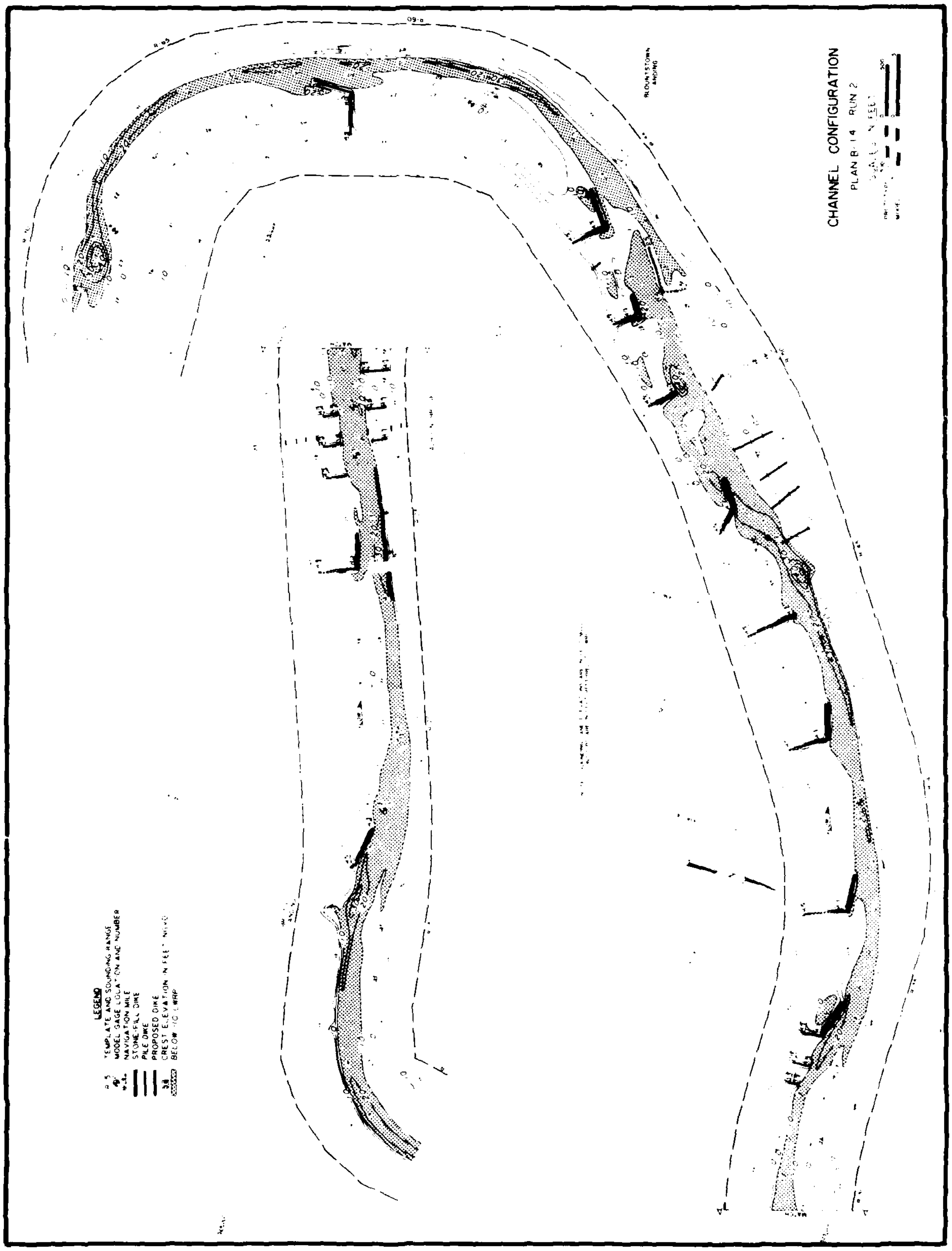



PLATE 18


CHANNEL CONFIGURATION
PLAN B-14 RUN 2
LEGEND
TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
PROPOSED DIKE

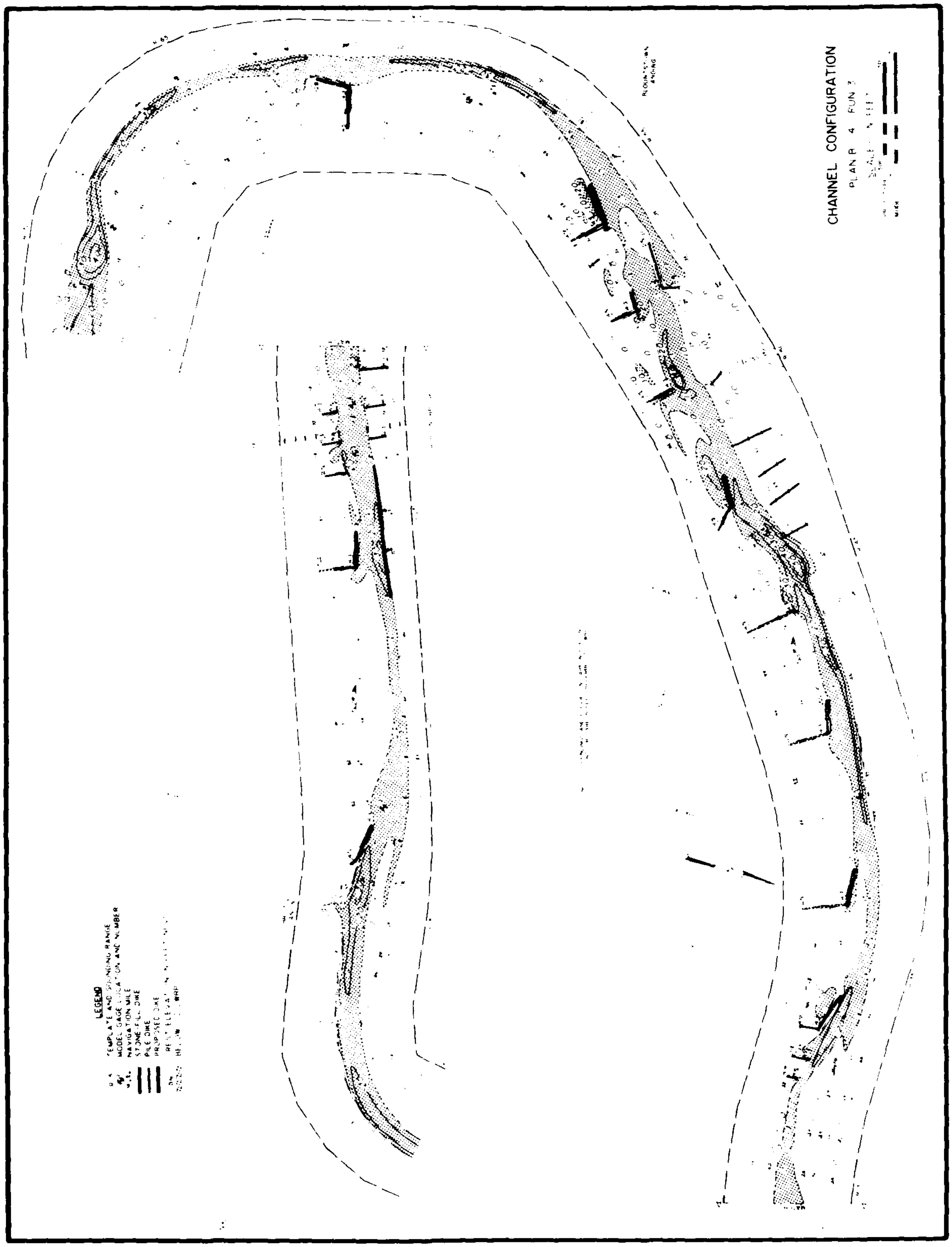
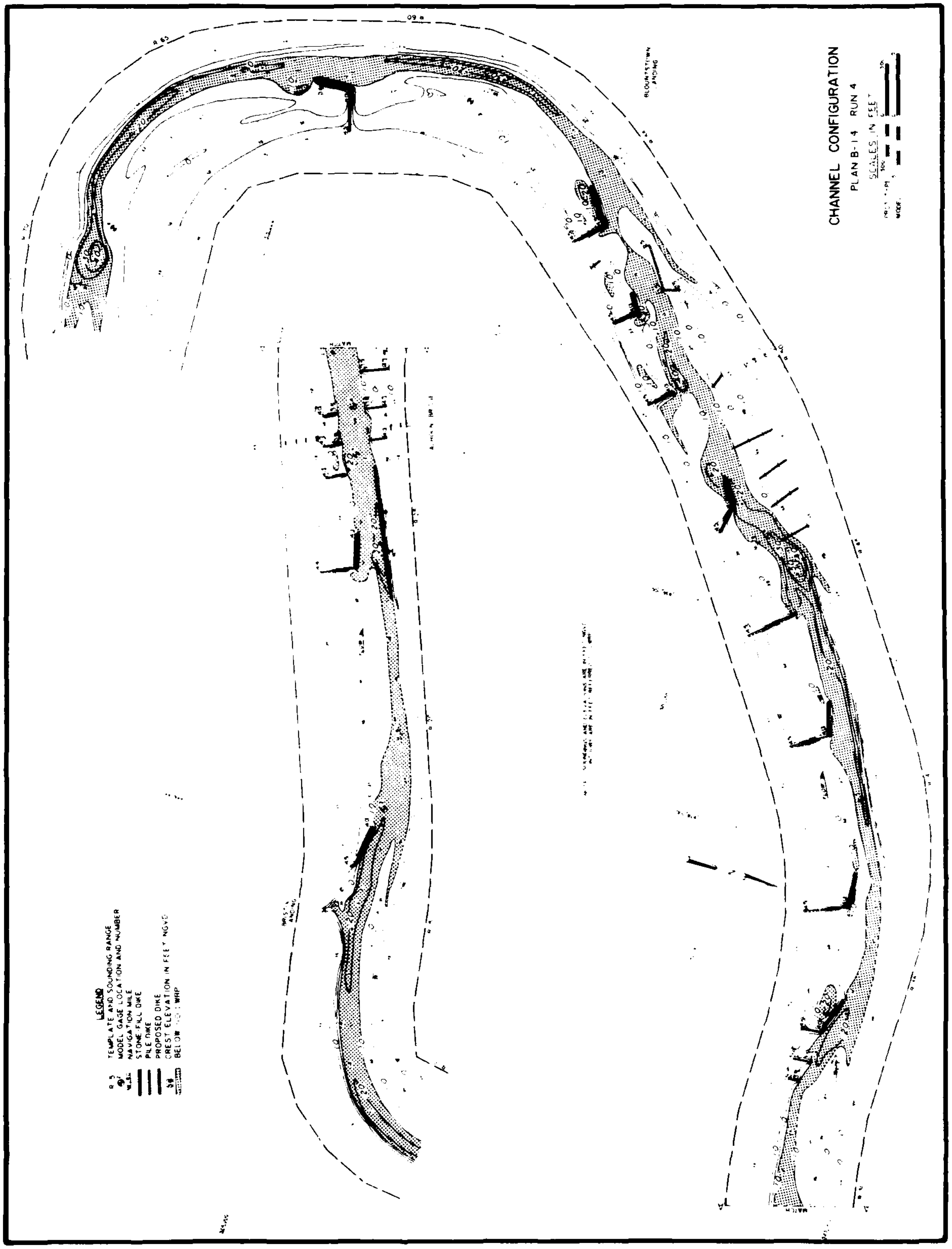



PLATE 20


CHANNEL CONFIGURATION
PLAN B-14 RUN 4
SCALES IN FEET
LEGEND
TEMPLATE AND SOUNDING RANGE
MODEL GAGE LOCATION AND NUMBER
NAVIGATION MILE
STONE-FILL DIKE
PILE DIKE
PROPOSED DIKE
CREST ELEVATION IN FEET NGVD
BELOW